INDIA RUBBER WORLD

OUR

64th YEAR

A BILL BROTHERS PUBLICATION

NOVEMBER, 1952

INDIA RUBBER WORLD, November, 1952, Vol. 127, No. 2. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $5.00 per year; Canada $6.00; All Other Countries $7.00; Single Copies 50 Cents. Address Mail to N. Y. Office.

Tire treads made with Philblack E surpass all existing records for mileage! Here's what actual road tests under severe conditions show. Up to 42% longer wear for cold rubber passenger car tires, compared with HAF black. And up to 24% more mileage for natural rubber truck tires, compared with natural rubber and EPC black. Tests proved super resistance to cut and crack growth, too!

Order Philblack E in truckload or carload quantities from the technical sales representative who calls on you, or from the nearest Philblack office.

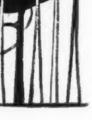
PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

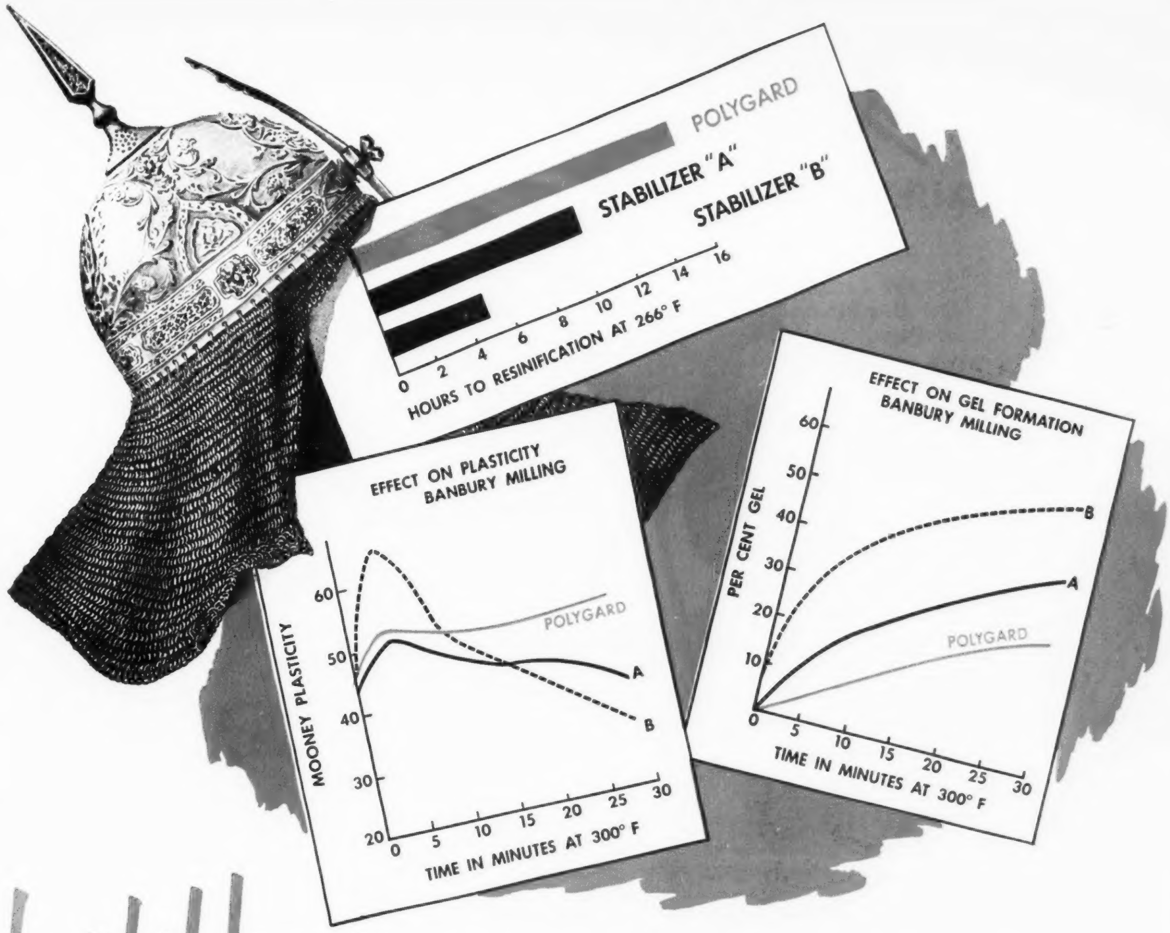
PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N. Y.

Phillips 66



* A Trademark

Philblack E, Philblack A and Philblack O are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.



Look How POLYGARD PROTECTS GR-S POLYMERS!

Here's a new, non-staining chemical stabilizer—developed by Naugatuck Chemical — that guards synthetic rubber quality all along the line.

* **Guards against pre-oxidation during manufacture**
* **Guards against processing heat**
* **Guards against deterioration during storage**
* **Guards against discoloration and staining in use**

Polygard's superior protective and color stabilizing properties have led to its extensive use in government synthetic plants in the production of non-staining polymers. These synthetic rubbers are used for the production of white wall tires, shoe soles, tile, hospital sheets, sponge rubber, wire insulation and scores of other products.

This new stabilizer may be used in either "hot" or "cold" rubbers, and is particularly recommended for the following non-staining grades: GR-S 1009, 1010, 1011, 1013, 1018, 1019, 1020, 1503, 1504, and X-682.

The charts above indicate the many advantages Polygard offers. For further information on this outstanding new stabilizing agent, send us the coupon below.

Naugatuck Chemical, 1311 Elm Street
Naugatuck, Connecticut
Please send technical data on Polygard to:

NAME..........................
TITLE..........................
COMPANY..........................
ADDRESS..........................
CITY..........................
ZONE.......... STATE..............

NAUGATUCK Chemical
DIVISION OF UNITED STATES RUBBER COMPANY
NAUGATUCK, CONNECTICUT

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Co., Ltd., Elmira, Ont.

Rubber Chemicals • Aromatics • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

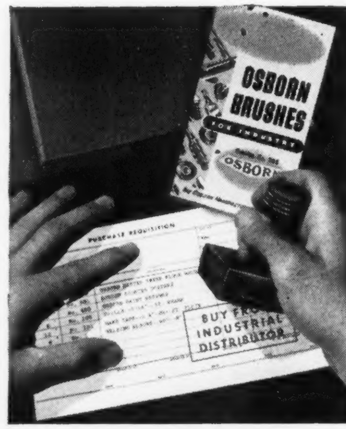
OSBORN

Why shop around? Just specify "OSBORN"

YOU KNOW OSBORN Brushes are good. To simplify buying and to assure getting unsurpassed quality, all you need to do is *specify* "OSBORN". No need for shopping around. No chance for questionable quality. You can buy OSBORN paint, maintenance and power brushes with confidence because their workmanship and materials are backed by 60 years of OSBORN service to Industry. Order them automatically from your INDUSTRIAL DISTRIBUTOR on the same order as other mill supplies. *The Osborn Manufacturing Company, Dept. 878, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

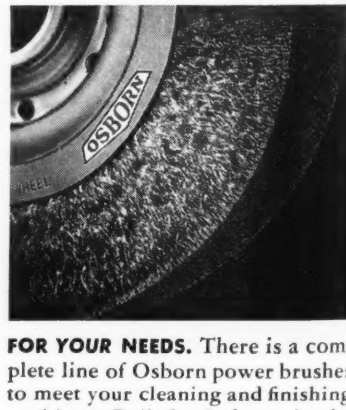
Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



IT'S SIMPLE. You can make one order cover OSBORN brushes and other leading-brand mill supplies when you buy from your Industrial Distributor. This standard practice streamlines your purchasing, cuts your supplies inventory, assures you good service on top quality products.

HANDY STOCK. Your Industrial Distributor carries a large stock of OSBORN brushes to supply you with the right type of brush promptly. Saves your time. The OSBORN Master* Sweep Floor Brush shown is a nationally recognized product.



FOR *YOUR* NEEDS. There is a complete line of Osborn power brushes to meet your cleaning and finishing problems. Built for Industry by the Company that knows Industry's problems. They do their jobs thoroughly and fast. *Trade-mark.

In Flexing and Abrasion Tests
Philblack* O *Scores Lots of Bests!*

Rubber compounds made with Philblack O pass laboratory Flexometer and Angle Abrader tests with exceptionally high scores! And when they get out in the workaday world they live up to their promises Conveyor belts, industrial hose and tire treads made with this HAF (High Abrasion Furnace) black show outstanding resistance to abrasion, aging, cracking, cutting and chipping. For example, 9:00 x 20 and 10:00 x 20 truck tires have been giving wear results as high as 150 miles for .001" non-skid loss. This corresponds to 53,000 miles of life for the original tread!

Bulk or bagged Philblack O is shipped from Borger, Texas, Lcl and Ltl bagged shipments are also available in Akron, Boston, Chicago, Trenton, Los Angeles, Montreal and Toronto.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING • AKRON 8, OHIO

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* A Trademark

Philblack A and Philblack O are manufactured in Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton.
West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.


UNIFORMITY
Makes the Big Difference
in INDUSTRIAL Fabrics
MT. VERNON FABRICS
Give You Greater Fabric Uniformity
Shown here is one of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here yarn tensile strength is being determined with 300-lb. vertical test.
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Branch Offices: Chicago · Atlanta · Baltimore · Boston · Los Angeles
TURNER HALSEY
COMPANY
Selling Agents
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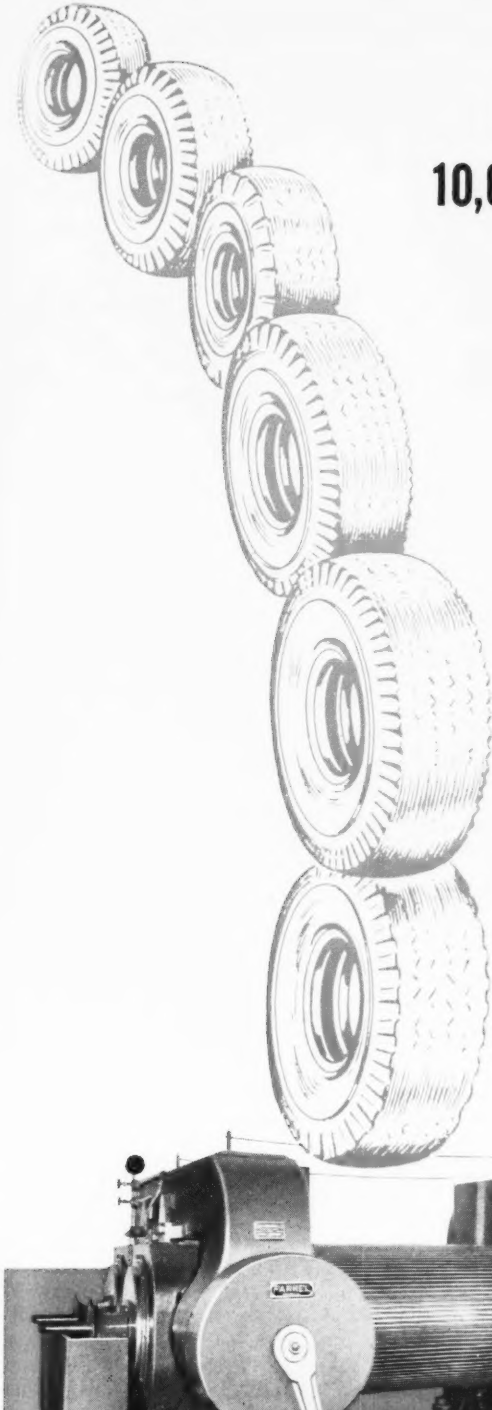


A NEW GIANT CRACKER WITH A 10,000-POUND-PER-HOUR APPETITE FOR WHOLE TIRE CARCASSES

Here is the largest and most powerful cracker ever built for the rubber industry. Equipped with 32″ x 54″ rolls, it is capable of chewing up whole tires, including the larger sizes such as are used on busses and trailer trucks, without prior debeading.

Carcasses can be ground to ½″ mesh, at a rate of 10,000 pounds per hour or even better. The rubber is stripped clean of the bead during the process.

The 32″ diameter rolls are of chilled iron, cored for water circulation. Both rolls are corrugated across the face, the back one with spiral saw teeth, and the front roll with straight "U" corrugations.

All gearing is enclosed in a separate 700 HP uni-drive connected to the rolls by universal spindles. This construction provides smooth and efficient transmission of power under the heaviest torque loads.

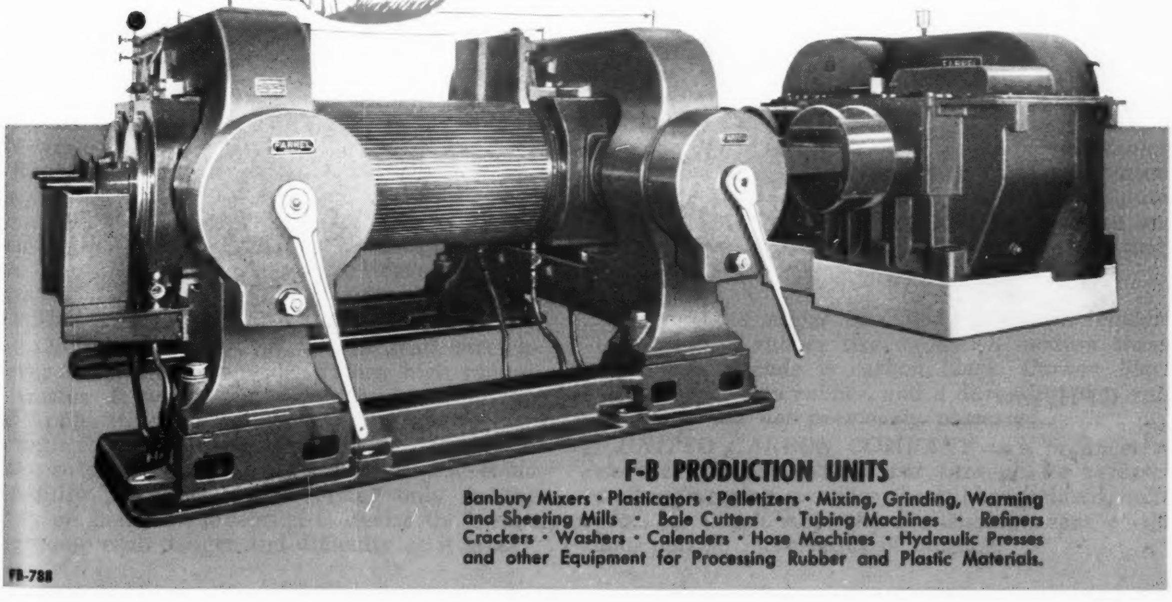
Housing and cap are cast integrally of high-strength Meehanite metal, making an extremely strong, one-piece structure. The rolls are removed endwise, so that it is not necessary to disturb any feed arrangement above the cracker when rolls are taken out for regrooving. This is an important consideration in service as severe as this.

Write for further details about crackers or any of the other production units listed on this page.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®



The C. P. Hall Company

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AKRON 8, OHIO

FACTORY AND GENERAL OFFICES
AKRON, OHIO

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CHICAGO 38, ILL

1340 EAST SIXTH ST
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BAY AVE AT WHEELER POINT RD
NEWARK 5, N. J.

CABLE ADDRESS "HALLCO"

November 27, 1952

To Our Customers:

With the advent of this Thanksgiving Season, we are happy to again have the opportunity to thank you for the part you have played in making our past year so pleasant and successful. We feel deeply indebted to you for your continuing trust and sincerely thankful for your proven loyalty.

We are duly thankful for the business which you have given us and trust that we have continued to maintain the high standards of service to which we aspire. It is our desire, also, that all your dealings with us have been to your entire satisfaction. Our constant aim is to merit your confidence and good will.

With best wishes for your enduring success and prosperity, we remain

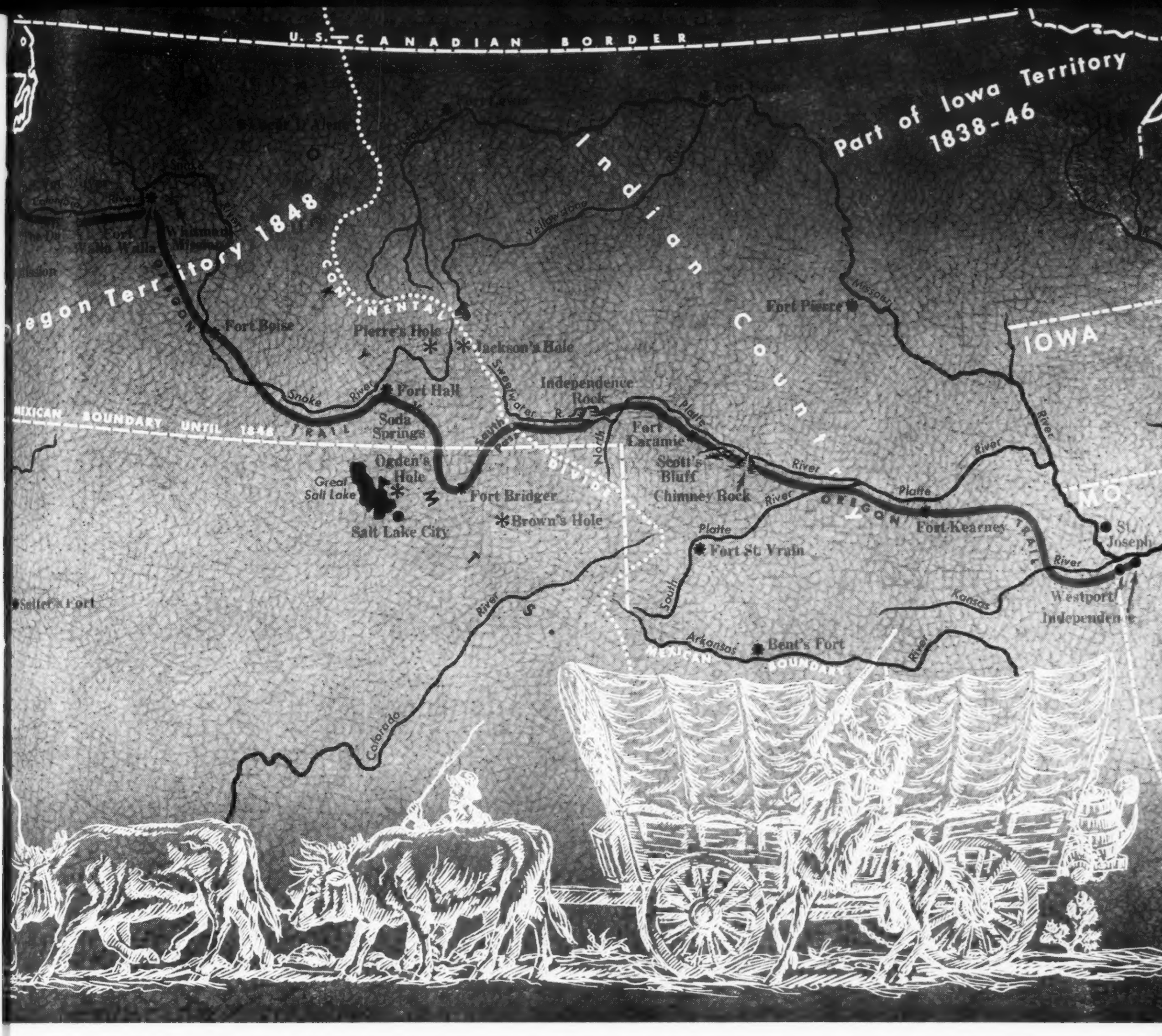
Very truly yours,

THE C. P. HALL COMPANY

C. P. Hall

C. P. Hall, President

CPH/mw



One in a Series of Famous Trails, a Reminder of Man's Progress in Transporting Himself and His Products.

THE OREGON TRAIL

In 1843, the "Great Emigration" left Independence, Missouri, for the long journey to Oregon. There were, Marcus Whitman wrote, "no less than 200 families, consisting of 1,000 persons of both sexes, 695 oxen, 773 loose cattle, more than 120 wagons." With good traveling conditions, the ox-drawn wagons lumbered along at two miles an hour. Some days only five miles were traversed. The emigrants started in mid-May, arrived at Whitman's Mission on the 10th of October.

The Oregon Trail was the longest trail, stretching over 2,000 miles with deep rivers, high ranges, arid wastes. It was the trail of the home-seeker. Jesse Applegate wrote in 1843: "No other race of men with the means at their command would undertake so great a journey, none save these could successfully perform it . . . relying only on the fertility of their own invention to devise the means to overcome each danger and difficulty as it arose."

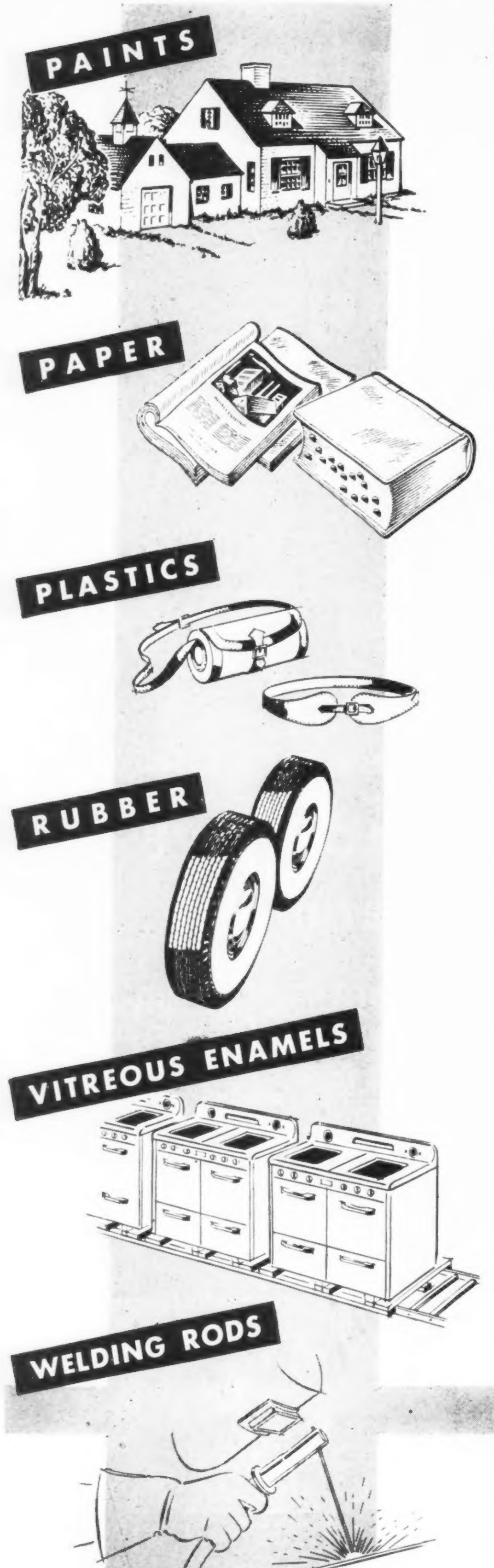
Highways and roadways thread their way where once there was but a trail. And wherever there are people who need goods, materials and transportation, the rubber tires on trucks, buses and passenger cars are in service. Days have become minutes in miles covered, and the products of Oregon and the far west are as commonplace in eastern markets as in Oregon.

....

One of the major contributions to the modern long-wearing rubber tire on which modern transportation depends is carbon black. Carbon black gives strength to rubber, and a durability that rubber tires had not previously possessed.

UNITED CARBON COMPANY is a producer of excellent carbon blacks and through its research and engineering provides the rubber industry with products which meet the challenging needs of the day, putting more miles in mileage.

UNITED CARBON COMPANY, INC.



LOOK TO TITANOX FOR TiO_2 TECHNICAL SERVICE

New Applications . . .

Take them to Titanox Technical Service

Skilled technologists and the most modern facilities for research and development are available through Titanox Technical Service for the investigation of new uses for titanium dioxide and titanium compounds. The recent introduction of TITANOX-TG, prime source of *non-pigmentary* TiO_2, makes titanium dioxide available in greater quantities and in a more usable form for the manufacture of improved enamels, heat resistant coatings, glass, welding rod coatings and many other products. New fields of application are now under consideration . . . perhaps Titanox Technical Service can help you.

Improved Formulation . . .

Ask Titanox Technical Service

Long experienced in the formulation of both pigmentary and non-pigmentary titanium dioxide for use in paints, paper, rubber, plastics and ceramics, Titanox Technical Service is always available for assistance with any formulation problem. Often, these specialists can suggest a change or recommend the use of one of the newer Titanox types which may improve your product.

More Efficient Utilization . . .

Check with Titanox Technical Service

For the most efficient use of Titanox pigments, you'll find our Technical Service—with its wealth of laboratory and research data, its years of service experience—can often be helpful to you. Perhaps they can suggest a new or different Titanox product that will speed production or lower costs.

For detailed information on the advantages of Titanox Technical Service, see your Titanox representative or write to the Titanium Pigment Corporation, Dept. WA, 111 Broadway, New York 6, N. Y.

®TITANOX

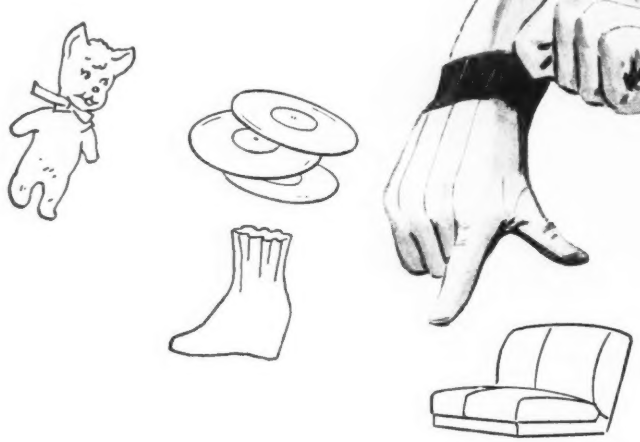
9625

TITANIUM PIGMENT CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

They last twice as long...vinyl products stabilized with "Dutch Boy"

DYPHOS



Two thousand hours *plus* in the Weatherometer without failure ... that's the record of "Dutch Boy" Dyphos stabilized vinyl compounds.

In plastisols, as well as organosols and emulsion dispersions, Dyphos gives you opaque vinyl products—unequalled in light- and heat-stability—excellent in color retention and long-lasting flexibility.

Dyphos gives you these advantages in vinyl moldings and extrusions, too.

Recommended also for systems using chloro-paraffins as secondary plasticizers, Dyphos is a general purpose stabilizer. You can rely on Dyphos to give your vinyl compounds the qualities needed for standout performance in service.

Let us show you how "Dutch Boy" Dyphos can simplify your operations...double the life of your vinyl formulations. Also investigate the other "Dutch Boy" chemicals. Just write for factual data and technical assistance.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy* CHEMICALS

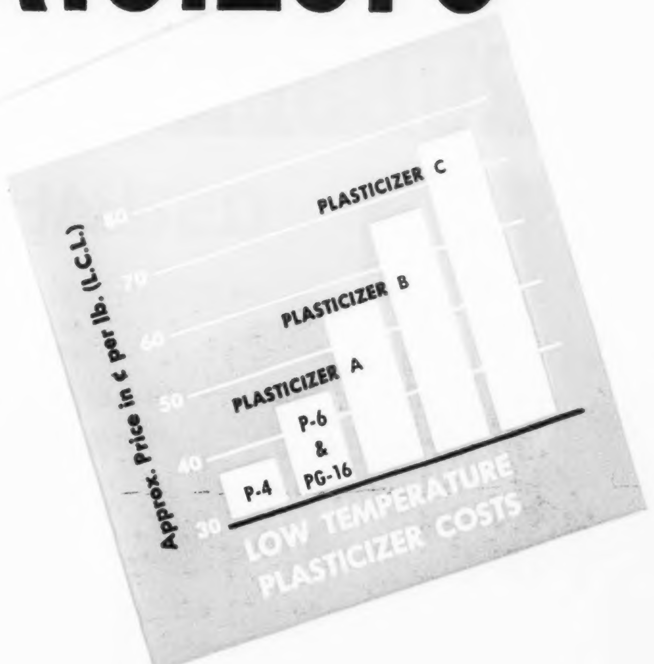
*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.

HOW TO CUT COSTS ON LOW TEMPERATURE / LOW VOLUME SWELL

Plasticizers



Ricinoleates are fully equivalent and, in many cases, superior to the commonly used low temperature plasticizers. An added feature is their extremely low volume swell in aromatic fuels. Their cost is much lower. Check this graphic comparison and you will see that costs can be cut substantially.

Baker Ricinoleate Esters:

PG-16, Butyl Acetyl Polyricinoleate	25% Nitrile Rubber
FLEXRICIN® P-4, Methyl Acetyl Ricinoleate	40% Nitrile Rubber
FLEXRICIN P-6, Butyl Acetyl Ricinoleate	Neoprene GN
FLEXRICIN P-4, Methyl Acetyl Ricinoleate	GRS

Mail convenient coupon for 1 quart samples and technical data sheets. Please clip to your letterhead.

Baker Castor Oil Company
120 Broadway, New York 5, N. Y.

Please send samples of the Ricinoleate Esters checked or Technical Bulletin.

☐ PG-16 ☐ P-4 ☐ P-6
☐ Technical Data

Name __________

Firm __________

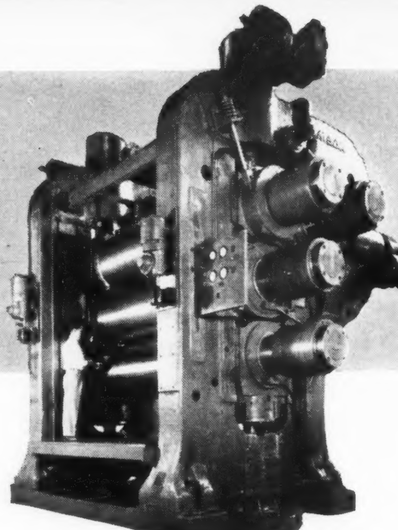
Address __________

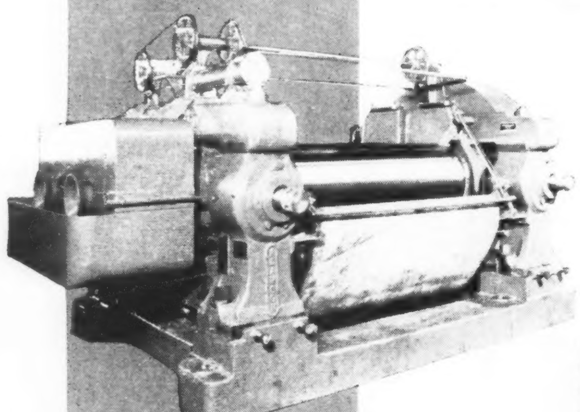
RW-112

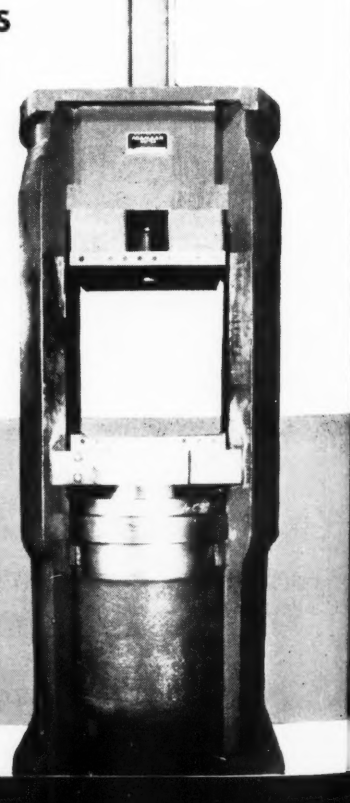
THE Baker CASTOR OIL COMPANY

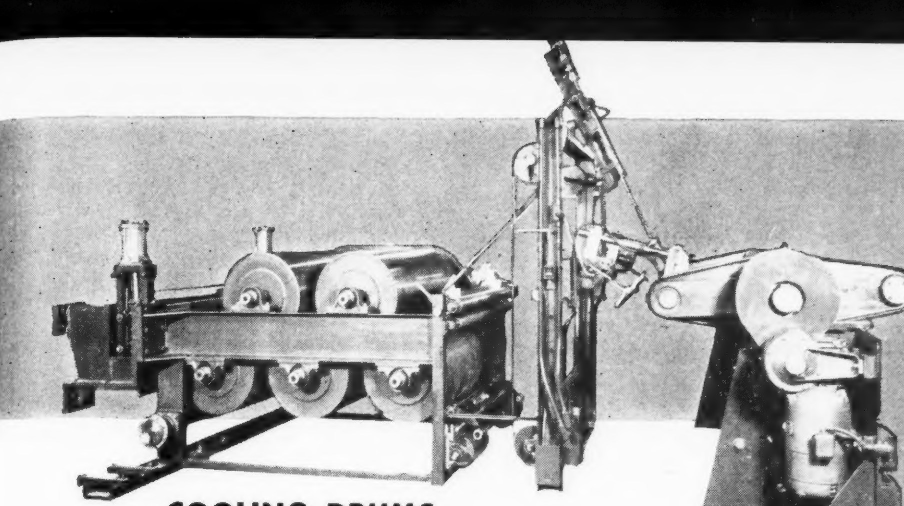
120 BROADWAY, NEW YORK 5, N. Y.

LOS ANGELES • CHICAGO









COOLING DRUMS
and TURRET-TYPE WINDUPS

This is a standard type of accessory equipment arrangement for plastics film. It consists of embossing equipment; cooling unit; slitting devices; compensator stand and automatic turret windup. The turret windup stand is a center-drive-type with automatic indexing equipment, yardage counter, and adjustable tension control. We design and build entire calendering process systems including all accessory equipment.

S — PRODUCTION UNITS

by..... ADAMSON UNITED

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and
dry
od-

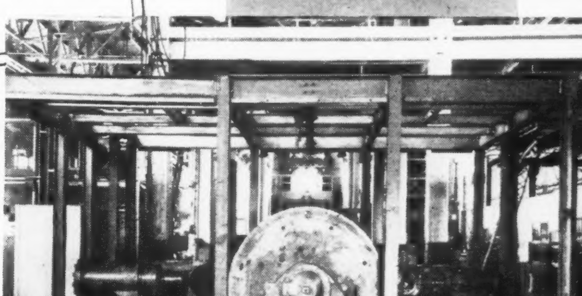
Wire, phone or write us today. No obligation.

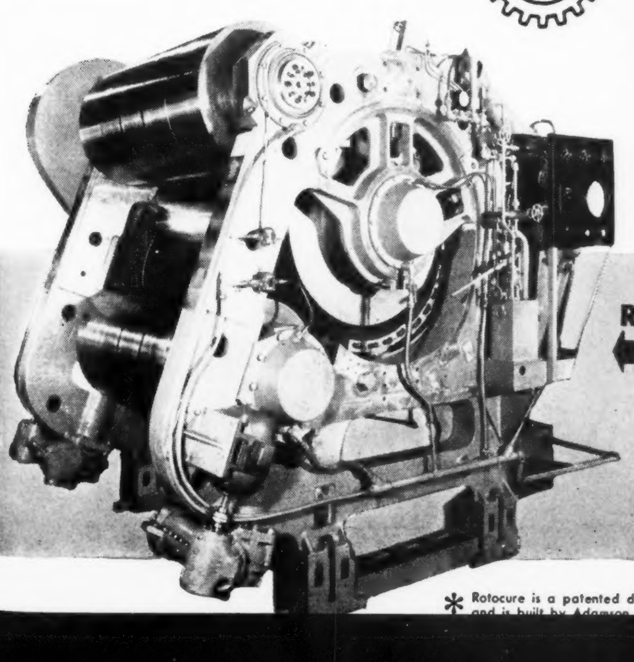
ADAMSON UNITED COMPANY
730 CARROL STREET • AKRON 4, OHIO

SALES OFFICES IN PRINCIPAL CITIES
Subsidiary of United Engineering and Foundry Company

BRAKE and TIRE TESTING MACHINES

Installation shows an 84" Adamson United High-Speed Jet Airplane Brake and Tire Testing Machine of the inertia type. We have built similar machines as large as 16 feet in diameter for speeds up to 250 M.P.H. and tire loads to 150,000 pounds.





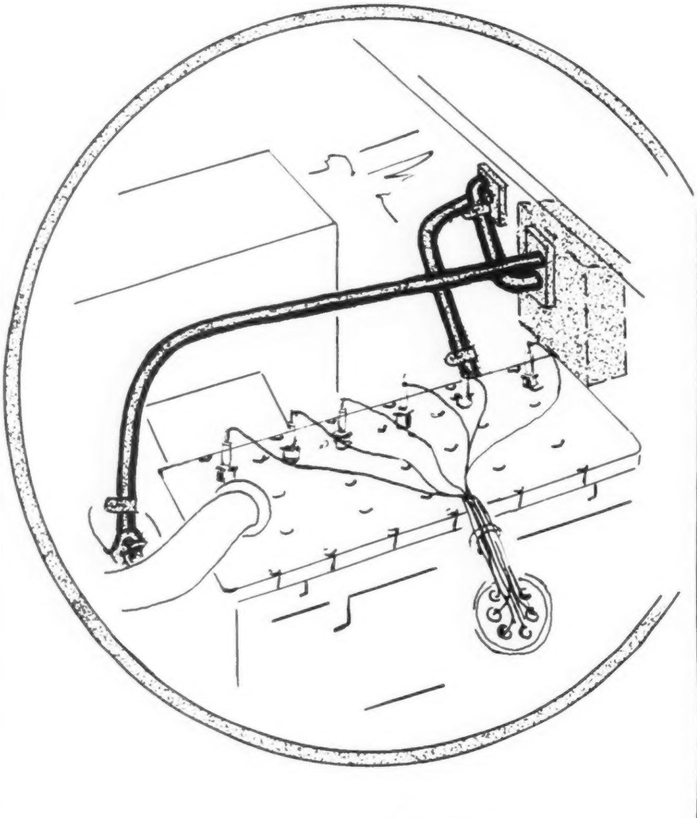
ROTOCURE*

A new machine for the continuous curing of all flat rubber or plastics articles with smooth or designed surfaces. Rotocure increases production through continuous operation without opening, cooling, reheating and closing. It eliminates overcuring or undercuring of the over-lap areas occurring on conventional presses. Roll and belt changes, incident to design requirements, can be made on this new 60" x80" Rotocure in one-tenth the time formerly required.

* Rotocure is a patented development of Boston Woven Hose and Rubber Co. and is built by Adamson United Co. under a licensing arrangement.

FOR AUTOMOBILE HEATER HOSE

. . . . *Pequanoc* MOCCASIN RECLAIM

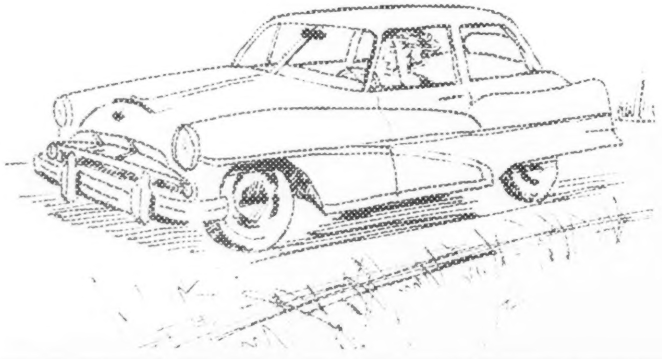


Car Heater Hose must stand up under extreme heat and cold.

Here is a typical, low cost formula which meets these demands.

FORMULA A-241-8

MOCCASIN	42.70
Rolled Brown Crepe	4.70
Mineral Rubber	12.45
Fatty Acid	.20
Sunproofing Wax	.40
Zinc Oxide	.60
Soft Clay	12.50
Whiting	12.50
MAF	8.30
Process Oil	4.60
MBTS	.35
DPG	.10
Sulfur	.60
	100.00
Est. lb. Cost	.0663
Specific Gravity	1.40
Est. Volume Cost	.0928
Cure	20 Min. @ 40#
Tensile	530
Elongation	210%
Durometer	75



Pequanoc Rubber Co.

MANUFACTURERS OF RECLAIMED RUBBER

MAIN SALES OFFICE and FACTORY: BUTLER, N. J.

You name the TEMPERATURE

...we'll supply the right PX PLASTICIZER

From protective coverings in the Arctic to beach mattresses in the Tropics, today's vinyl plastic products must meet new and rugged temperature conditions. The broad line of Pittsburgh PX Plasticizers will provide you with the specific plasticizer, or the combination of plasticizers, you need to insure optimum *stability* and *flexibility* in vinyl products under practically any temperature extreme.

And remember this: as a basic producer, we're also able to offer you the assurance of top uniform plasticizer quality from one order to the next . . . fast, efficient shipments . . . and dependable, continuing supplies. What's more, our engineers may be able to show you how to further increase the quality of your product and reduce production costs through better plasticizer selection and use. *Why not call or write us today?*

PX-104	DiButyl Phthalate
PX-108	DiIsoOctyl Phthalate
PX-138	DiOctyl Phthalate
PX-208	DiIsoOctyl Adipate
PX-238	DiOctyl Adipate
PX-404	DiButyl Sebacate
PX-408	DiIsoOctyl Sebacate
PX-438	DiOctyl Sebacate
PX-658	TetraHydroFurfuryl Oleate
PX-917	TriCresyl Phosphate

W&D 4240

PLASTICIZER DIVISION

PITTSBURGH COKE & CHEMICAL CO.

Grant Building - Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON


A COMPLETE CYCLE OF OPERATION
To make a bicycle all that is needed is some steel tubing, some wheels, a chain, pedals, ball bearings, gear wheels, spokes, a saddle, handlebars and various other accessories—not forgetting of course, the all important tyres which complete the job.
That is where we come into the picture—the Shaw Monoband Process is the fastest and most economical method of building Cycle Tyres with a wire bead. By this process, the complete tyre is built in one operation, including the application of the tread. It is, in fact, a complete cycle of operations for completing the cycle.
SHAW
MONOBAND PROCESS
SHAW
FRANCIS SHAW AND CO. LTD.,
MANCHESTER II, ENGLAND
Industry's headquarters for the best in Plastic & Rubber Machinery.

Ever since you were knee-high to a hop-toad, you've heard about America's wonderful *natural resources*—the bountiful fertile fields, the towering timber growth, the boundless water power, and the untold wealth of gold, iron, oil, silver, coal and other natural treasures that lie buried in the ground.

Is it because America has *more* natural resources than any other country that Americans enjoy the world's highest standard of living? No—many countries have as much—some have more.

Then is it because Americans *do* more with what they've got?

Yes! And the reason is as plain as the nose on your face. It's because Americans are free to develop their natural resources—and their natural resourcefulness—in the wholesome climate of *open and strenuous COMPETITION.*

COMPETITION—not "regimentation"—is what eggs a man on to do his best.

COMPETITION—not government control—is what urges a business to give its customers ever greater value for their money.

So let's say "NO SALE" to the *ism* peddlers who would have us swap our U. S. A. system of free competition for their "planned" regimentation—trade our U. S. A. freedom and plenty for their serfdom and poverty!

* * *

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THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER

DOUBLE-CHECKED CHEMICALS FOR THE RUBBER INDUSTRY

For ULTRA FINE PARTICLE SIZE

USE SHARPLES ACCELERATOR 57-9

XTRUDED ZINC DIMETHYLDITHIOCARBAMATE

TRY THIS TEST

Granules of SA 57-9

1. Are stable in handling and storage.
2. Crush easily.
3. "Rub out" to a non-gritty, dustless powder for complete dispersion in the rubber batch.

The ultra-fine particles of SA 57-9 insure maximum accelerator dispersion—of great importance to compounders, especially in the insulated wire and cable industry.

Physical Properties of SA 57-9

Physical Form	Xtruded granules
Color	White to slight yellow
Melting Point	243°F. (min.)
Chloroform Insoluble	1.8% (max.)
Volatiles	0.5% (max.)
Specific Gravity @ 20°/4°C.	1.65

Samples and technical information available from:

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC.

A SUBSIDIARY OF THE PENNSYLVANIA SALT MANUFACTURING COMPANY

500 Fifth Ave., New York • 80 E. Jackson Blvd., Chicago • 106 S. Main St., Akron
Martin, Hoyt & Milne Inc., San Francisco • Los Angeles • Seattle • Portland
Shawinigan Chemicals, Ltd. • Montreal • Toronto
Airco Company International, New York

MEET HI-SIL "C"

COLUMBIA-SOUTHERN'S *newest* WHITE REINFORCING PIGMENT

Columbia-Southern is now making available to the rubber industry a completely new product designed to permit a new high in quality. This new white reinforcing pigment is Hi-Sil "C"—a hydrated silica currently being manufactured on an interim plant scale.

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REGULAR HI-SIL

CURE	MODULUS 100%	300%	500%	TENSILE	ELONGATION	HARDNESS 0"	30"	TEAR
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30	230	840	1890	2520	580	66	57	170
60	230	790	1990	2480	560	67	60	150

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CURE	MODULUS 100%	300%	500%	TENSILE	ELONGATION	HARDNESS 0"	30"	TEAR
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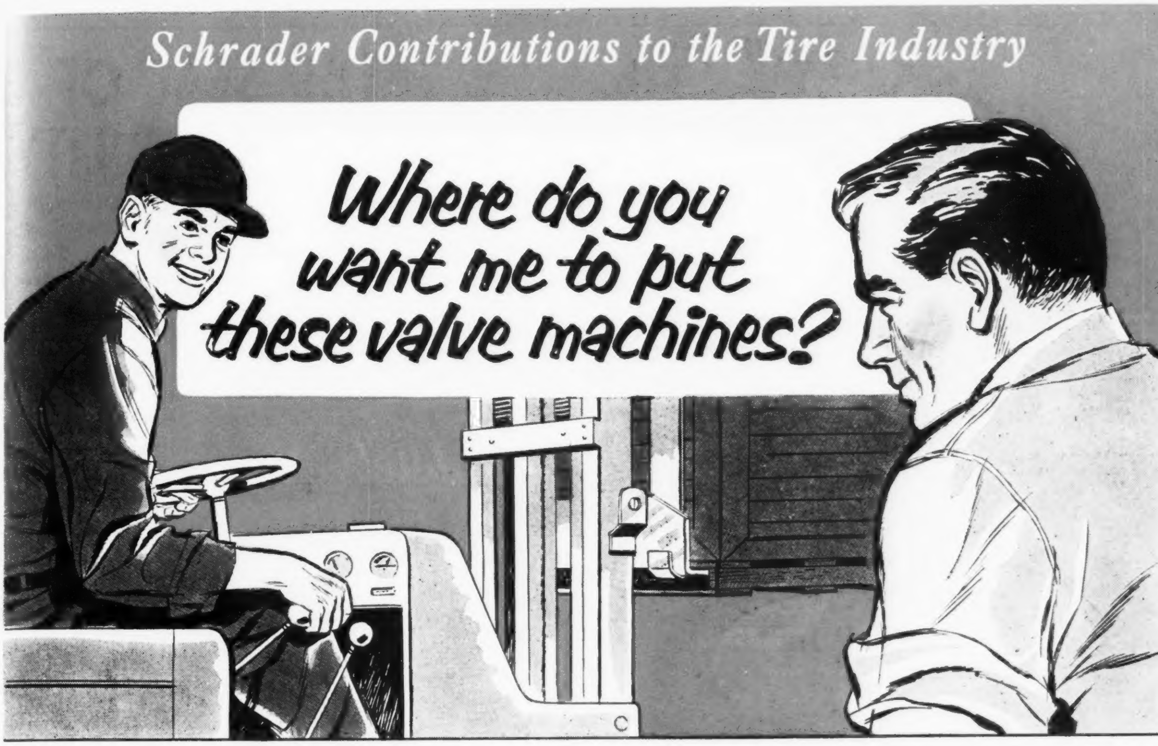

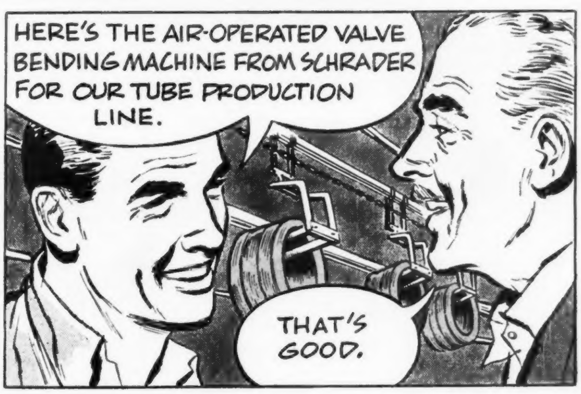

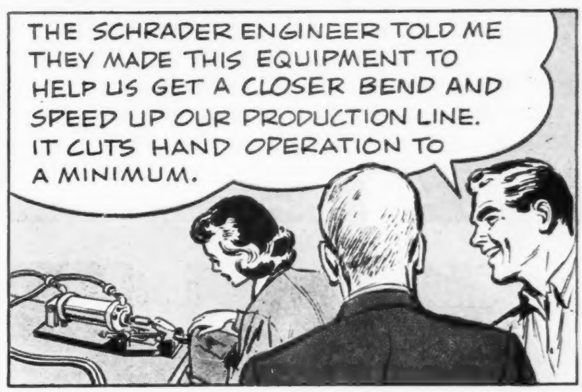

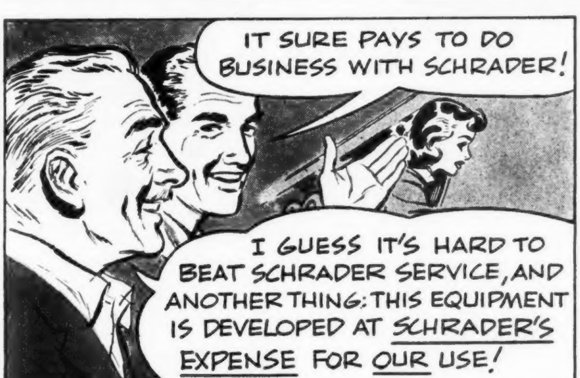

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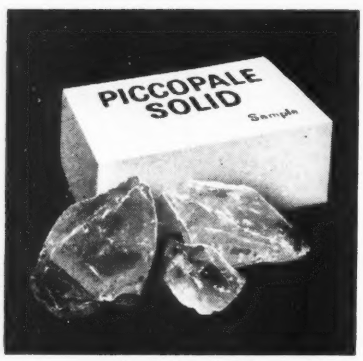

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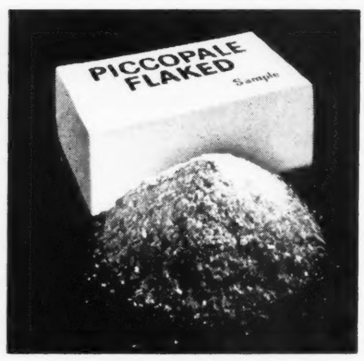

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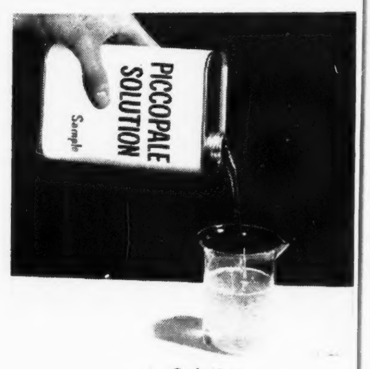

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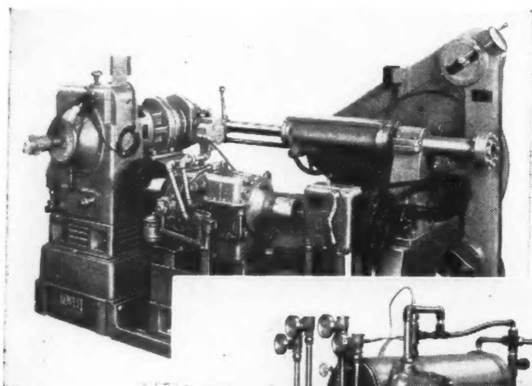

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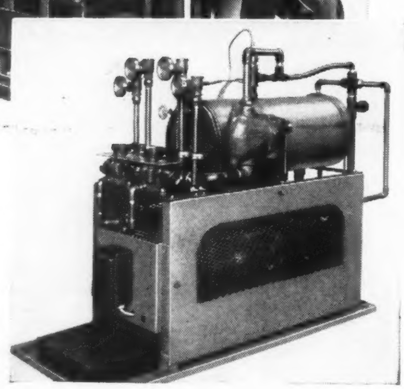

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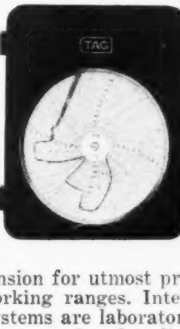

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NOVEMBER, 1952
Vol. 127—No. 2

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A BILL BROTHERS PUBLICATION

Published Monthly by
BILL BROTHERS PUBLISHING CORPORATION

Editorial and Executive
386 Fourth Ave.,
New York 16, N. Y.
LExington 2-1760.

Office of Publication
Orange, Conn.
Chicago Office: 333 N. Michigan Ave.
STate 2-1266.

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VOL. 127—NO. 2 NOVEMBER, 1952

The Relationship between the Modulus of Reinforced Rubber Compounds and the Physical Properties of Various Carbon Blacks[1]

Merton L. Studebaker[2]

A STUDY of the relationship between the properties of various types of carbon black and the modulus of rubber compounds reinforced by them has been undertaken. The modulus of a rubber compound is always increased when it is reinforced by carbon black, and this increase is largely determined by the nature and the amount of carbon black which is used. An analysis of all available data has shown that in every case the modulus of a rubber compound could be correlated with the ultimate analysis of the carbon black and its oil absorption or Mooney viscosity. In those cases where unsatisfactory correlation was obtained using oil absorption, it was improved by substituting the Mooney viscosity. The relationships appear to be important, and it is expected that much valuable information will result from this work.

In addition to the nature of the carbon black, the modulus is influenced by a number of other factors like milling procedure, other compounding ingredients, state of cure, etc. These factors have not been exhaustively studied because of the complexity of the problem, and this preliminary paper reports only the initial work on the subject.

It is obvious that the increase in modulus which accompanies reinforcement involves the operation of forces of various types. There are some who feel that these forces are physical in nature. Others feel that they are chemical forces.[3] Possibly it will be found that both types are involved.

Two types of physical forces could be involved, (1) particle-to-particle attraction which is responsible for agglomeration and (2) particle-to-liquid attraction which is involved in wetting. Chemical forces might result from (1) carbon-sulfur-polymer linkages or (2) a polymerization or "immobilization" which might be induced by chemical groups present at the surface of the carbon.

In this investigation, using a colloidal approach, rubber-carbon black mixtures were considered to be analagous to thick dispersions. The properties of these thick dispersions are determined mainly by (1) solid-to-liquid attraction, (2) solid-to-solid attraction, and (3) electrical forces which cause repulsion between the particles. In a system like carbon dispersed in a hydrocarbon or in rubber these repulsive forces are not important.

Carbon-to-Carbon Attraction

Whenever two particles are brought close together, they attract each other by what have been called long-range London-van der Waals forces. These are the forces which are responsible for flocculation. When these forces are strong, as with oil blacks, the carbon is sometimes said to have *high "structure."* Our theoretical knowledge of these forces has been summarized by Verwey and Overbeek.[4] There is a large gap, however, between theory and practice in this field.

Every colloid chemist can think of a number of phenomena which can be explained only by the operation of these forces. *Flocculation* and *agglomeration* are possible only because of them. Agglomerated carbon black has definite physical properties like *apparent density* and *resistance to compression* which are the result of their action. Without these long-range London-van der Waals forces, *pelleting* carbon black without a binder would be impossible. Furthermore the *properties of the carbon*

[1] Presented before the Division of Rubber Chemistry, A. C. S., Cincinnati, O., Apr. 30, 1952.

[2] Phillips Chemical Co., Akron, O.

[3] For references and discussions see: J. R. S. Waring, *Ind. Eng. Chem.*, 43, 352 (1951); R. L. Zapp, E. Guth, *Ibid.*, 430; R. S. Stearns, B. L. Johnson, *Ibid.*, 146; D. Parkinson, *British J. of Applied Phys.*, 2, 273 (1951).

[4] "Theory of the Stability of Lyophobic Colloids." Elsevier Press, Inc., Houston (1948).

black pellets are dependent upon these same forces. The *false body* of the ink and paint chemists, the *yield value* of slurries, the *sedimentation volume* of flocculated black dispersed in a liquid, the "*stickiness*" of black in bulk—all are examples of properties largely dependent upon the operation of these long-range London-van der Waals forces. The list can be made quite long.

In the initial phases of this study *oil absorption* was used as a property which depends primarily upon particle-to-particle attraction. *The greater the oil absorption, the stronger will be this particle-to-particle attraction.*

Carbon-to-Rubber Forces

Solid-to-liquid attraction is studied by methods which evaluate the relative wettability of the solid by a given liquid. Hydrophilic solids have a high affinity for water and other polar liquids. Hydrophobic solids have a low affinity for water, but a high affinity for hydrocarbons and other non-polar liquids. Carbon is a typically hydrophobic material, and rubber can be considered as a hydrophobic medium. *The more strongly hydrophobic the carbon, the greater will be the force of attraction operating between a given area of carbon black surface and the rubber in which it is dispersed.*

Some years ago experiments were conducted by the author in the laboratories of General Atlas Carbon Co., in which the relative wettabilities of a number of carbon black samples were determined. The method used was a modification of one developed by Wolkova.[5] Recently the data have been evaluated on the basis of the ultimate analyses of the various carbon black samples, and the following empirical equation has been worked out. It correlates the values for wettability, Cos θ_{H_2O}, with the hydrogen content and the oxygen content of the carbon black.[6]

$$(1)\ \text{Cos}\ \theta_{H_2O} = (0.037 \times \%\ \text{Oxygen}) - (0.185 \times \%\ \text{Hydrogen}) + 0.284$$

Note that the coefficient, 0.185, is exactly five times the coffiecient, 0.037. The same ratio of these coefficients for hydrogen and oxygen recur in the equations expressing the relationship between *modulus*, *Mooney viscosity*, *hydrogen content*, and *oxygen content*. It seems likely that it is more than a coincidence.

From these considerations it can be reasoned that *the carbon-to-rubber forces are strongest per unit of surface with those carbons which contain the greatest amount of hydrogen and the smallest amount of oxygen.*

Correlation of Properties with Modulus

Early attempts to correlate *modulus* with *oil absorption* and *wettability* data indicated that a relationship existed between these three variables on the one natural rubber compound for which data were available. Experimental errors in wettability measurements impose a limitation, however, on the correlation to be obtained with these data.

The relationship in equation (1) suggested the replacement of wettability measurements by ultimate analyses of carbon black. These ultimate analyses can be made with considerably greater precision than the wettability measurements. New nomographs were constructed with data for *modulus*, *oil absorption*, *oxygen content*, and *hydrogen content* of the carbon black.

In the first data treated, a nomograph, Figure 1A, was constructed using the modulus data for various types of carbon black in low-temperature GR-S rubber (X-485) from the article by Drogin, Bishop, and Wiseman.[7] The ultimate analyses were obtained from a report by United Carbon Co. to the office of Rubber Reserve, RFC, in connection with Government Tire Test Projects AX-AU,[8] and from a paper by Snow, Wallace, and Sweigart.[9] The correlation of properties was satisfactory, and the equation representing the nomograph was worked out.

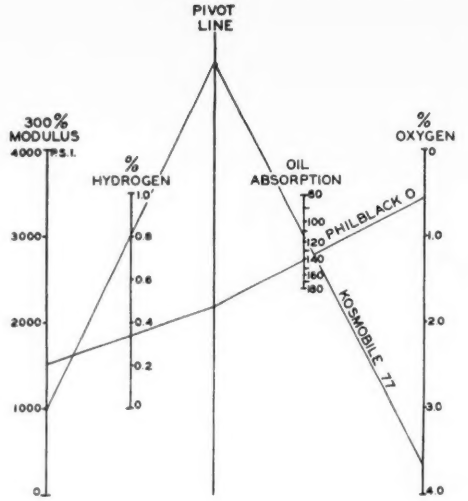


FIGURE 1A
NOMOGRAPH FOR EQUATION

$$\frac{300\ \%\ \text{MODULUS}}{1000} = (5 \times \%\text{H}) - (0.755 \times \%\text{O}) + 5.52\ \text{LOG OIL ABSORPTION} - 11.6$$

$$(2)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\ \text{H}) - (0.755 \times \%\ \text{O}) + 5.52 \times \log\ \text{Oil Absorption} - 11.6$$

where M = modulus, H = hydrogen, and O = oxygen.

One method of testing the equation is to assume three of the four variables to be correct and calculate the fourth. In such a procedure it is best to use the three most accurately determinable variables and to calculate the least accurate quantity. In this case the oil absorption is calculated from the equation using the modulus, hydrogen content, and oxygen content. The results are listed in Table 1 and plotted in Figure 1B. Reasonable correlation between experimental and calculated values was found.

TABLE 1. PROPERTIES OF CARBON BLACKS AND LTP GR-S X-485 VULCANIZATES

Carbon Black	% Hydrogen	% Oxygen	Experimental Oil Absorption[7]	Calculated Oil Absorption*	300% Modulus at Maximum Tensile in X-485[7]
Kosmobile 77	0.80	3.66[9]	112	113	970
Kosmos 60	0.23	0.06[9]	166	167	1780
Philblack 0	0.34	0.56[8]	150	139	1510
Statex K	0.29	0.47[8]	122	131	1160
Vulcan[7]	0.17	0.57[8]	160	168	1100
Kosmos 40	0.41	0.00[9]	83	74	800
20	0.36	0.30[9]	87	87	690

*Calculated from equation (2).

[5] *Kolloid-Z.*, 67, 280 (1934).
[6] M. L. Studebaker, C. W. Snow, "The Influence of Ultimate Composition upon the Wettability of Carbon Blacks," presented before the Division of Colloid Chemistry, A. C. S., Atlantic City, N. J., Sept. 16, 1952.
[7] *Rubber Age (N. Y.)*, 64, 309 (1948).
[8] I. Drogin, H. R. Bishop, C. W. Snow, "Evaluation of Natural Rubber and Different Types of GR-S with Various Carbon Blacks for Government Tire Test Projects AX-AU," Jan. 29, 1949, submitted to Office of Rubber Reserve by the United Carbon Co.
[9] "The Oxidation of Carbon Blacks," paper presented at the A. C. S. Rubber Division, Cleveland, O., meeting, May 27, 1947.

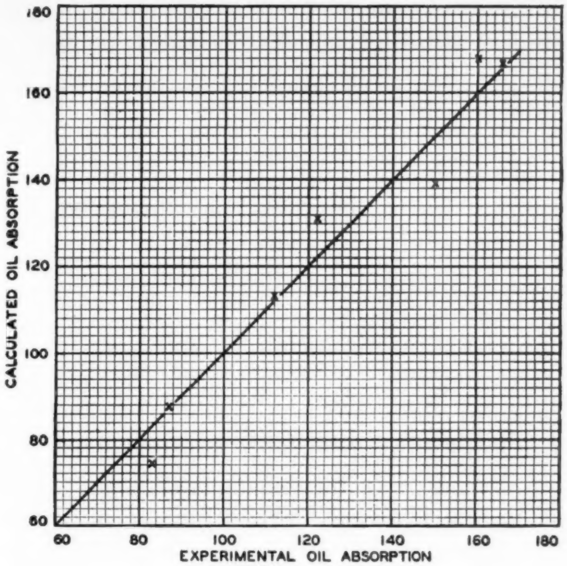


FIGURE 1B
OIL ABSORPTION VALUES CALCULATED FROM EQUATION IN FIGURE 1 VS. EXPERIMENTAL VALUES

In equation (2) the ratio of coefficients for hydrogen and oxygen is not five to one. This indicates that our explanation in terms of wettability and oil absorption was probably an oversimplification. However, for virtually all of the data studied the correlation between modulus, oil absorption, hydrogen content, and oxygen content can be expressed by the general equation:

$$(3)\ \frac{\text{Modulus}}{1000} = a \times \%\text{Hydrogen} - b \times \%\text{Oxygen} + c \times \log \text{Oil Absorption} - d.$$

The constants a, b, c, and d are dependent upon such factors as the type of polymer, the other compounding ingredients present and their amounts, the state of cure, the milling procedure, the procedure for determining oil absorption and the units in which it is expressed, etc. Oil absorption is not the only property which can be used in this equation. Other properties which are functions of oil absorption like extrusion shrinkage in GR-S, specific volume at a fairly high pressure, etc., can also be substituted for it if appropriate adjustment of constants is made.

In the Government Tire Test Program AN-AU, several laboratories reported rubber data and physical and chemical tests on the same carbon black samples which were analyzed by United Carbon and which were mentioned previously. The tests of Sperberg and Svetlik on these samples[10] were treated as described above, and the following equations represent the results in the polymers which were tested.

Natural Rubber

$$(4)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\text{H}) - (0.5625 \times \%\text{O} + 2.95 \log \text{Oil Absorption}$$

GR-S

$$(5)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\text{H}) - (0.47 \times \%\text{O}) + 3.3 \log \text{Oil Absorption} - 0.23$$

GR-S-10

$$(6)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\text{H}) - (0.47 \times \%\text{O}) + 3.2 \log \text{Oil Absorption} - 0.32$$

GR-S X-435 (41° F.)

$$(7)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\text{H}) - (0.47 \times \%\text{O}) + 3.1 \log \text{Oil Absorption} - 0.25$$

GR-S XP-137 (14° F.)

$$(8)\ \frac{300\%\ \text{M}}{1000} = (5 \times \%\text{H}) - (0.47 \times \%\text{O}) + 3.3 \log \text{Oil Absorption} - 0.10$$

where M, H, and O have the same meaning as in equation (2).

Once again the correlation was reasonably satisfactory and about as good as the experimental oil absorption values. Note that the coefficients for hydrogen are the same in every case. The coefficients for oxygen are the same in the synthetic polymers tested, but differ in natural rubber.

After the determination of these relationships and the study of them on a number of sets of data, it was decided to evaluate the relationship for a series of pellated and loose carbon black samples. Here the relationship was less satisfactory. One probable reason for this condition is that the work performed in running the oil absorption values is very small in comparison with the work done in milling the carbon black into rubber. Small changes in density of the carbon black make a considerable change in oil absorption as is shown in Figure 2. Here the oil absorption of a number of samples of Philback A, all collected at the same time from different spots in the plant, is plotted against their apparent density. It can be seen that the oil absorption values are very dependent upon the work done in densifying the black.

This sensitivity to previous treatment is considerably greater than the change in rubber properties of a compound containing these blacks, as can be seen in Figure 3, which represents the variation in modulus with density of these same samples. Whereas the modulus varied approximately 15%, the oil absorption varied 30%.[11]

These factors made it necessary to look for another variable to replace oil absorption in our relationship—one in which the milling would be comparable to that which the rubber sample had received prior to making the modulus determination. Since the rubber-carbon black mixtures were considered analagous to thick dispersions, Mooney viscosity was a logical property to try. This resulted in a somewhat different relationship between the four variables. In this case the logarithm of the oil absorption could be replaced by either the *logarithm of the Mooney viscosity* or by the *Mooney viscosity* itself. The data are not sufficiently precise to choose between the two, and equations for both functions are presented later in equations (9) through (14). However, reasoning by analogy, it seems most likely that the logarithm of the Mooney viscosity more accurately represents the relationship.

[10] "Evaluation of Elastomers and Carbon Blacks for Government Tire Test Programs AN-AU Inclusive," Report to Office of Rubber Reserve, Oct. 18, 1948, from Phillips Petroleum Co., Bartlesville, Okla.

[11] NOTE: An examination of a large amount of data from a number of sources revealed that the effect of pelleting upon modulus varied considerably between laboratories and even in the same laboratory for different milling procedures. For instance, in the set of rubber data, plotted in Figure 3, the effect was quite pronounced. The values in Table 2 do not show this large difference. In some instances pelleting seems to slow down the rate of cure, and the modulus values are more nearly equal when the modulus values are compared at equal states of cure.

TABLE 2. PROPERTIES OF CARBON BLACKS AND GR-S VULCANIZATES**

Carbon Black	Hydrogen* %	Oxygen* %	Oil Absorption† C. C./G.	Mooney Viscosity‡ (Experimental) ML-1½ @ 212° F.	Mooney Viscosity (Calculated) §	Mooney Viscosity (Calculated) ¶	300% Modulus-Lbs./Sq. In. @25% C. S. (x)	300% Modulus-Lbs./Sq. In. @45% C. S. (x)	300% Modulus-Lbs./Sq. In. @60% C. S. (x)
Thermax (unpelleted)	0.30	0.02	0.36	48	47	44	450	440	375
P-33 (unpelleted)	0.45	0.20	0.52	47	41	33	400	390	335
Pelletex (loose)	0.39	0.51	0.90	56	55	55	1115	950	810
(Pelleted)	0.39	0.22	0.83	52	52	50	1100	1030	930
Philblack A (pressed)	0.35	0.40	1.60	59, 67	69	70	1890	1500	1315
(Pelleted)	0.36	0.35	1.27	64	65	68	1870	1715	1595
Philblack O (pressed)	0.29	0.71	1.48	77	80	83	2065	1725	1390
(Pellets)	0.30	0.61	1.17	76	78	81	2095	1870	1705
Shawinigan Acetylene (100% Compressed)	0.07	0.12	2.61	74	81	83	1600	1490	1000
SAF (Z-115)	0.30	1.23	1.68	105	89	90	2055	1765	1375
Spheron 3 (loose)	0.41	2.52	1.32	100	90	91	1390	1275	1070
(Pelleted)	0.41	2.49	1.03	95	89	91	1400	1170	980
Spheron 9 (loose)	0.65	3.46	1.37	90	89	91	1610	1455	1260
(Pelleted)	0.65	3.00	1.04	87	81	83	1620	1500	1340

*Hydrogen values determined by combustion analysis. Oxygen values by direct (Unterzaucher) analysis after subtraction of 40% of ash.
†Raw linseed oil.
‡After standing 24 hours. ML-1½ or ML-4 after milling or after a 24-hour rest can be used if the constants in the equation are properly adjusted.
§Using equation (9).
¶Using equation (12).
(x)Compression set, ASTM Method B.

**Compound:

GR-S X-630	100.0	Circosol 2XH	2.0
Zinc oxide	5.0	Sulfur	1.8
BLE Powder	1.25	Santocure	1.0
Stearic acid	2.0	Carbon black	50.0
Paraflux 2016	2.0		

Except for channel blacks where 1.3 parts Santocure were used.

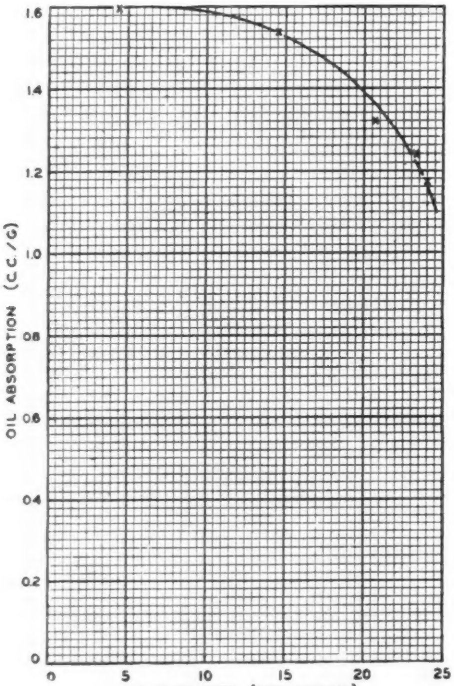


FIGURE 2
THE RELATIONSHIP BETWEEN APPARENT DENSITY OF PHILBLACK A AND OIL ABSORPTION-LOOSE BLACK, PRESSED BLACK AND PELLETS OF VARIOUS DENSITIES

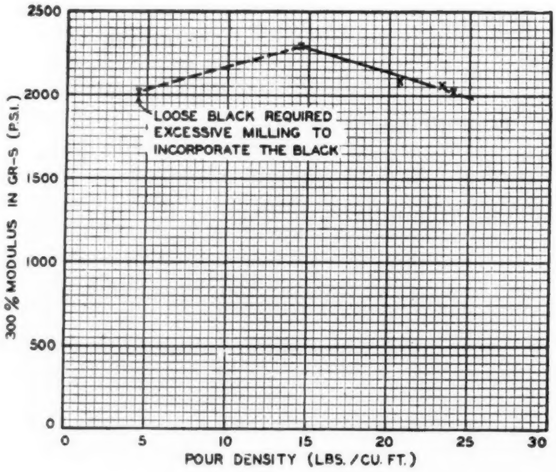


FIGURE 3
EFFECT OF APPARENT DENSITY OF PHILBLACK A ON MODULUS

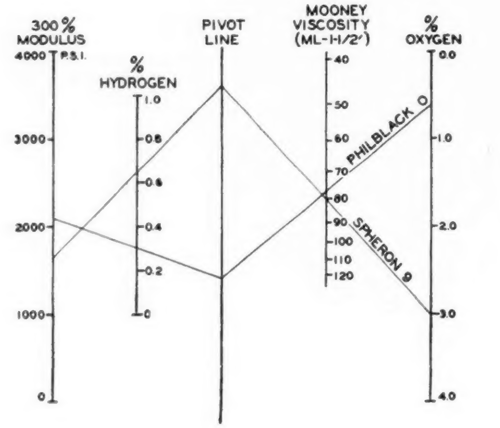


FIGURE 4A
NOMOGRAPH FOR EQUATION (9)

$$\frac{300\%\ \text{MODULUS}}{1000} = (5 \times \%H) - (\%O) + 10.33\ \text{LOG}\ (\text{ML-1-1/2'}) - 18.34$$

To illustrate these new relationships, nomographs were set up from data for the series of uncompressed, compressed, and pelleted carbon blacks in a GR-S compound. Two of these nomographs and their equations are shown in Figures 4A and 5A. The modulus values were taken at equal values of compression set.

The calculated values for Mooney viscosity are plotted against the experimental values in Figures 4B and 5B. The correlation is satisfactory, considering the accuracy of the four determinations and the effect of experimental error upon the calculated and experimental values.

In a study of this kind it is necessary to adopt some procedure for selecting the proper state of cure. In the early work the modulus was taken at the cure which produced the maximum tensile. In later work, however, we have taken the modulus at equal states of cure as indi-

cated by compression set. It is interesting to compare these equations at several values of compression set. This comparison can be done as follows:

Using the equations containing the logarithmetic function of Mooney viscosity we have:

@ 25% Compression Set

$$(9)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 10.33 \log (ML\text{-}1\tfrac{1}{2}') - 18.34$$

@ 45% Compression Set

$$(10)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 9.4 \log (ML\text{-}1\tfrac{1}{2}') - 17.03$$

@ 60% Compression Set

$$(11)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 8.5 \log (ML\text{-}1\tfrac{1}{2}') - 15.39$$

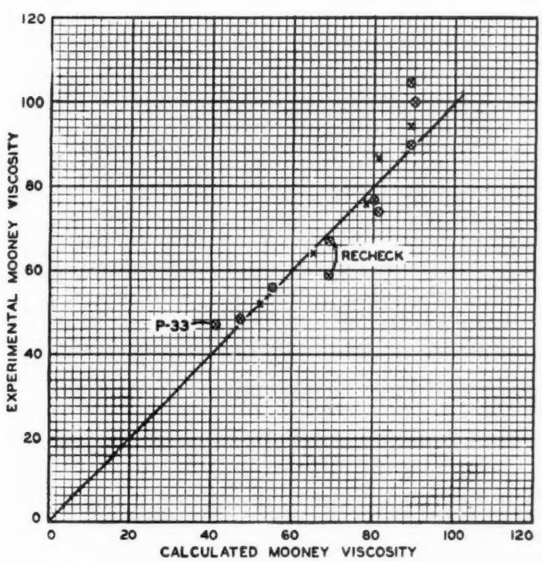


FIGURE 4B
CALCULATED VALUES OF MOONEY VISCOSITY FROM EQUATION IN FIGURE 4A VS. EXPERIMENTAL VALUES

PELLETED SAMPLES x, UNPELLETED SAMPLES ●

Using ML-1½′ instead of log ML-1½′ we have:

@ 25% Compression Set

$$(12)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 0.0605 \times (ML\text{-}1\tfrac{1}{2}') - 3.67$$

@ 45% Compression Set

$$(13)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 0.060 \times (ML\text{-}1\tfrac{1}{2}') - 3.8$$

@ 60% Compression Set

$$(14)\ \frac{300\%\ M}{1000} = 5 \times \%H - \%O + 0.0564 \times (ML\text{-}1\tfrac{1}{2}') - 3.82,$$

where M, H, and O have the same meaning as in previous equations.

It can be seen that only the last two constants in the equations change with compression set. The relationship between the coefficients for hydrogen and oxygen remain in the ratio of 5:1.

When a carbon black sample contains very much ex-

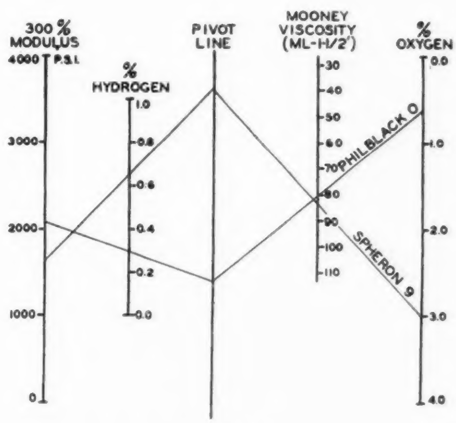


FIGURE 5A
NOMOGRAPH FOR EQUATION (12)

$$\frac{300\%\ \text{MODULUS}}{1000} = (5 \times \%H) - (\%O) + 0.0605 \times \text{MOONEY VISCOSITY} - 3.67$$

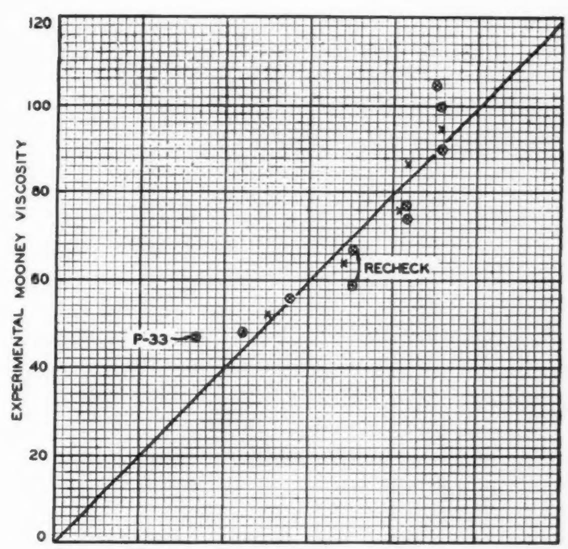


FIGURE 5B
CALCULATED VALUES OF MOONEY VISCOSITY FROM EQUATION IN FIGURE 5A VS. EXPERIMENTAL VALUES

PELLETED SAMPLES x UNPELLETED SAMPLES ●

(*Continued on page 225*)

Development and Use of Rubber in Bituminous Pavements[1]

Harry K. Fisher[2]

THIS paper will purposely omit any reference to base or sub-base portions of a pavement. These parts of the pavement are separate studies by themselves. We all know that the quality of the materials and type of construction of these portions of the pavement will affect the bituminous part. We proceed on the premise that this part of the pavement is satisfactory to the engineer. No laboratory test results on preliminary studies on rubber-bitumen pavement will be released in this paper in detailed technical form.

During the past three years considerable work has been done on the development of the use of rubber in pavements. To discover if there is a need of such development work we ask ourselves two questions:

1. Is there a need of improvement of highway pavements?
2. If highway pavements can be improved, what are the best possible ways to make the improvements?

Need of Improvement of Highway Pavements

My answer to the first question is to study the increase in vehicle registration during the past 20 years; then study the type of highway and street pavements now in place to meet the requirements of these vehicles. Next, study the maintenance cost figures of maintaining the pavements now in use. From the information available to us on these subjects we find an urgent need of prompt action by highway officials to improve street and highway pavements. From all of this we are convinced that some study should be made as to the use of rubber in paving materials, as we noted certain changes in bitumen when the two materials are blended together, changes that indicate improvements probably will occur in the pavement.

The answer to the second question will be covered further on in this paper.

Some Problems of Rubber in Roads

To determine fully all the facts on the use of rubber in bituminous pavements will require much scientific knowledge and experience, along with vision, imagination, and ingenuity on the part of those participating in the work. When we study the problem, we find it an involved and complex one. Suppose we list a few of the complex factors:

1. Rubber is produced in many types and in several forms.
2. Bitumen is produced from several sources, is of many types, and comes in several forms.
3. Rubber and bitumen vary as to both physical and chemical properties, depending on the natural or the chemical properties from which they were obtained, as well as the method employed in processing them for pavement purposes.
4. Temperature and time factors affect these materials and especially after they have been blended together.
5. What are the methods of testing best suited to determine the true value of these materials when blended for pavement purposes.
6. A variety of paving specifications is in use, also many types of materials used in pavements.
7. Pavements are laid on many types of soil and in different climates, some with extreme temperature changes.

When we study this list, we see the problem is not a simple one. We are fortunate in having at our disposal, however, much data on past paving experiments which will aid us in our work. This information was established by state and city highway departments in their search for better pavements.

It is true that the final answer to what rubber may do toward improving a pavement will have to be determined by final performance results of a pavement in use. Much laboratory work can be done while we await final results. To get the full story with all of the facts we must do considerable laboratory work along with field studies; neither of these can be neglected.

The laboratory can certainly aid us in deciding the correct size of rubber powder to be used. It can help us to determine the best way of incorporating the rubber. It can assist us in discovering the best form of rubber to use. It will produce much information as to the type of rubber which gives best results. We can learn what effect vulcanization of the rubber has on the finished paving materials. We can discover the best type of bitumen for a rubber-bitumen blend.

We must study the nature and amount of filler used in making and shipping dry rubber powder, especially as to its influence on the rubber during shipping and storage, also as to its effect on the mixing procedure when we blend rubber with bitumen or add it in dry form to a paving mixture.

A difference of opinion exists as to the best method of introducing rubber into paving materials. Some of us advocate mixing the rubber with the bitumen; others feel that best results can be obtained by adding the rubber to the other materials first and then adding the bitumen. This situation is a healthy one in the early development stages of the use of rubber in pavements. It shows that we are giving the subject careful and serious attention. Each method of suggested use has its individual problem. The best method to be employed will unquestionably be determined by the actual performance results of a pavement in place.

The Natural Rubber Bureau Research Laboratory

A well-equipped laboratory has been established at Rosslyn, Va., by the Natural Rubber Bureau. All types of standard testing equipment, of the most modern design, have been installed for use of the laboratory tech-

[1] Based on a paper presented before engineering societies in England and Europe, Sept.-Oct., 1952.
[2] Rubber road consultant, Natural Rubber Bureau, Washington, D. C.

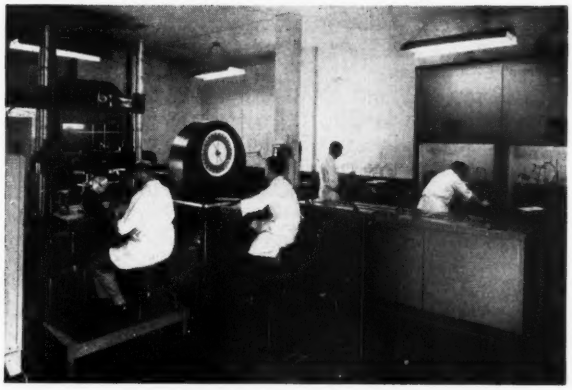


Fig. 1. View of Part of the Interior of the Natural Rubber Bureau Research Laboratory. In the left foreground is a close-up of a rubber-asphalt specimen being put through a Hveem Stabilometer test on a high compression machine. In the left background, a test is being run on some rubber powder, and in the right background a distillation check is being made on solvent used in rubber road tests

nicians in their work on rubber in roads. Specialized equipment has also been added. Standard and approved test procedures are followed when routine tests are made. Some modified and improvised tests are made in research and study experiments.

In this laboratory, equipment is available for making Hveem Stabilometer tests,[3] Marshall tests,[4] and Hubbard Field stability tests.[5] The latest type of mechanical compactor[3] was purchased so there would be proper uniformity of specimens, as well as a high rate of production of specimens for test purposes. In this way the human error that at times is present, when other methods of compaction are used, has been eliminated. A special type of ductility testing equipment[6] was purchased in order to have the best temperature control possible in conducting this test.

In running Abson[7] recovery tests, two 1,000-gram Braun-Dulin Rotarex machines are used in addition to the customary centrifuge available in most modern laboratories. A 60,000-pound Baldwin-Tate-Emery universal testing machine was purchased to aid in making different tests for the determination of the stability of highway pavements. An Atlas Weatherometer, Enclosed Model, Twin Arc, Type HVDL-X, is being obtained for accelerated aging tests on bitumen mixtures with and without rubber. Thermostatistically controlled water baths, electric drying ovens, microscopic equipment, and all of the other necessary equipment are available so that the personnel of the laboratory can maintain a high degree of accuracy in their work, and the test results can be duplicated, when required. Figure 1 shows some of the equipment in the laboratory.

Laboratory Results to Date

Our laboratory work to date has given us some partial facts; we say "partial" as we have not accepted them as final conclusions. We recognize that most tests in this type of development are progressive in character, and we have much data on uncompleted tests. Some of the interesting things we have discovered are:

1. Certain percentages and types of rubber blended with particular types of cut-back bitumen, when mixed as plant mix materials, greatly increase stability and cohesion of the materials.
2. We find that blends of rubber and cut-back bitumen, when used in surface treatment work, materially increase tackiness and elasticity of the bitumen.
3. By slightly modifying a joint filler test we are able to show the change in susceptibility of the asphalt to temperature changes after rubber has been added to the bitumen.
4. We have evidence from observational studies of pavements in-place, especially on heavily traveled roads, that small as the rubber portion is in the pavement, where it has been added to the aggregates, it appears that in absorbing part of the light oil fractions of the bitumen, it tends to prevent bleeding, also to retard the rate of loss of these fractions by traffic action and solar radiation.
5. Observational studies of a test road in Canada give evidence that the oil-soaked particles in the pavement appear to cushion vibration and traffic shock. This possibility is receiving more study. We hope to improvise laboratory tests to develop much more information on this subject.
6. We find that different rubber powders, when added to bitumen paving materials, do not always show similar results. In many of our tests we found a slight increase in percentage of voids and a slight lowering of stability. One rubber powder with which we experimented showed increasing stability with decreasing percentage of voids. Another showed increasing stability as well as decreasing, depending upon the rubber concentration present in the experiment, along with almost no change in percentage of voids. We question the stability results of rubber specimens tested, as they were obtained using equipment designed for tests of straight bitumen mixes.
7. Our laboratory studies show us we have a different material when rubber has been added to paving mixtures; there is an increase in elasticity, cohesion, and viscosity. In many cases there has been an increase in the softening point of the bitumen.

It is best that I call attention to the fact that we have, in most cases, only completed a few tests of each type of rubber and asphalt. Few conclusions have been made or could be made from our past work. Our studies have

Fig. 2. A view of workers of the Los Angeles, Calif., Bureau of Street Maintenance putting down the first rubber-bitumen pavement in the Far West

[3] "Detailed Procedure for Testing Bituminous Materials," Sept. 1, 1951. State of California, Division of Highways, Materials & Research Department, Sacramento, Calif.

[4] Highway Research Board Report No. 7B, 1949 Symposium on Asphalt Paving Materials, National Research Council, Highway Research Board, 2101 Constitution Ave., Washington, D. C.

[5] "Rational Design of Asphalt Paving Mixtures." Asphalt Research Institute Series No. 1, Oct. 15, 1935. Asphalt Research Institute, 801 Second Ave., New York, N. Y. Also, "1928 Proceedings of Association of Asphalt Paving Technologists."

[6] "Standard Method of Test for Ductility of Bituminous Materials." "1949 ASTM Standards," Vol. 3, p. 1049, Method D113-44. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

[7] "Standard Method of Test for Hot Extraction of Asphaltic Materials and Recovery of Bitumen by the Modified Abson Procedure." *Ibid.*, p. 1054, Method D762-49.

included six types of natural rubber powder made under different formulae, three different types of GR-S powder, both synthetic and natural latex, guayule, and many different brands of reclaimed rubber. Add to these rubbers the different types of bitumen to be tested, and you will understand our reluctance to form conclusions at this point.

Other Development Work

In addition to our laboratory studies we have given considerable time to perfecting a mixing procedure, on a commercial basis, of blending rubber with bitumen. Full realization of the scope of this problem is understood by those who have attempted it. Several solutions are known; yet none of these fully answers all requirements.

In the United States we have laid test roads in 19 states and the District of Columbia. (See Figure 2). We have also laid test roads in three provinces of Canada. The state of Massachusetts leads in having more than 300 miles of rubber-bitumen pavements in-place on its highway system. All types of rubber have been used in these experiments. We have added the rubber to the bitumen on some of these tests, but most of the roads were laid where the rubber was added to the other materials prior to the introduction of the bitumen to the mixture.

It is my desire in presenting this paper to cover the problems of the development work rather than go into details of technical tests and their procedure. As previously stated, I think it best to withhold the release of preliminary test reports since erroneous conclusions might result from such action. It is my belief that this paper should be confined to a study of the problems of our work and, where possible, offer solutions to these, along with suggestions as to a policy we should follow in our development work.

The Value of Rubber in Roads

With regard to the second question presented in the first part of this paper, the economic value of rubber-bitumen pavements, as compared to straight bitumen types, will be determined on the basis of the functional properties of these pavements. These properties are: (1) elasticity; (2) cohesion; (3) adhesion; (4) shock and vibration resistance; (5) susceptibility to temperature changes; (6) durability.

The paving engineer has been seeking for many years to improve these functional properties of a bituminous pavement.

It is recognized that the action of the elements—sun, heat, cold, and moisture—must also receive attention in determining the economic value of rubber-bitumen pavements.

At present the paving engineer, in striving to improve the properties of bituminous pavements, is carefully checking the quality and gradation of all materials used in pavement construction and is improving mixing and laying techniques. There is a big possibility that we can aid him in this work by introducing rubber to paving materials.

In making our studies of this subject we must be careful that we do not make the mistake of overemphasizing the chemical side of our experiment. There is a chemical side, and chemical work must be done to aid the development of the use of rubber in pavements. We must not fail, however, to recognize that, regardless of the method we use to introduce rubber, blend it with bitumen, or blend it with other materials, the physical properties of the finished pavement will decide the value of the pavement. In view of this fact it becomes apparent that we must give considerable time to the study of the physical changes which occur in pavements, both with and without rubber. These studies must include both laboratory prepared specimen studies, as well as specimens taken from pavements in use.

Our research and studies should proceed along the line of approach used by the paving engineer. We should use standard and accepted tests. Where we find it necessary to develop a new type of test, or where we modify a standard test, we must make this fact known when we announce the results of our studies. We remember that each state and most large cities in the United States have well-equipped laboratories. These laboratories have done considerable research during the past 15 years. They will carefully check our announced results. With the testing equipment now available to use we can get indications of what final results may be expected on each type of paving material we check. With this information we can make any desirable changes long before the pavement in-place gives us the final story.

From what we have so far learned we are encouraged to continue our studies. We have only a few facts as to improvements of pavements through the use of rubber; none of these is in complete form; we must make many more tests to get the full story. We are cutting sections from the pavements in-place and returning these to the laboratory. Here we carefully study the large sections before they are cut to test-specimen size. In this way we hope to get information as to what actually occurs in pavements during different time periods.

It is probably well to mention here that laboratory technicians know that each testing method now in use has its limitations. In lieu of more positive types of tests we are grateful for what we have, and the existing methods do aid us materially in our search for more knowledge on pavements.

Ultimately we hope to furnish technical papers on our work along the lines here mentioned and being conducted by the Natural Rubber Bureau Research Laboratory. I again state that it is my opinion that nothing can be gained by releasing partial information on incompleted tests. The danger that premature conclusions might be made with such information justifies withholding reports of tests until final conclusions have been determined. This policy of non-release will not be adopted on all types of tests, but we believe it should be enforced on tests that may take considerable time to complete.

Letter to the Editor

The Editor,
India Rubber World
386 Fourth Avenue
New York 16, N. Y.

Dear Sir, 7th October, 1952

Referring to Mr. R. Geenty's interesting paper on Plasticizer Migration in your August, 1952, issue, may we have the hospitality of your columns for the following comments:—

While we agree with Mr. Geenty that his test is simple, accurate and reproducible, we do not agree that the property it covers is what is normally called "migration." His test would probably be excellent for absorbing, and measuring, exudation, in the case of a plasticizer of limited miscibility, but we do not think that Mr. Geenty intended to include this phenomenon in his term "migration."

(Continued on page 275)

Hose Compounding[1]

Frank S. Gregory[2]

Fig. 1. Examples of the Four General Types of Rubber Hose: (1) Double-Jacket Woven Hose; (2) Wrapped Fabric Hose; (3) Horizontal Braided Hose; (4) Vertical Braided Molded Hose

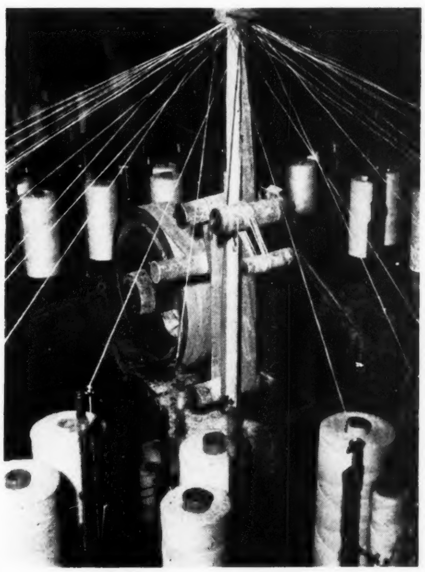


Fig. 2. High-Speed Vertical Braider Which Applies One or More Braids of Reinforcement

FOUR general classifications of rubber hose are manufactured by the industry: (1) woven hose; (2) wrapped hose; (3) horizontal braided hose; (4) vertical braided hose. Figure 1 shows examples of these four types of hose together with some indication of their construction features.

Woven hose consists of an extruded tube inside of a jacket woven on a circular loom and finds its greatest use as fire hose. Wrapped hose is that type in which layers of frictioned fabric are used for the reinforcement. This-type hose is built on a pole and vulcanized under a cloth wrapping in open steam. Horizontal braided hose is also made on a pole, and the extruded tube is passed through a series of horizontal braiders where layers of various types of textile yarns and wires are applied, with a sheet of rubber between each layer of reinforcement. Hose may be manufactured to provide a wide range of burst pressures by this method. The fourth type of hose, molded vertical braided, is probably of the greatest interest, and the remainder of this paper will be devoted to a discussion of the problems of compounding and processing involved in the manufacture of this type of hose.

Every rubber product must meet specific requirements because of the end-use for which it is intended. In addition, some products require special properties in the compound for processing reasons. Examples of such special processing requirements in hose compounding might be friction stocks of a soft, tacky nature to give good adhesion to fabric, or stocks for tubing which, to give good appearance, are often highly loaded and contain appreciable amounts of oils. Such stocks give a smooth extruded finish and have less tendency to sag under heat during cure than less highly loaded compounds.

Manufacture of Vertical Braided Hose

The manufacture of molded vertical braided hose is the mass production process for making hose. In this process the tube is extruded in the conventional manner, coiled on a round board to cool, and is then braided on a vertical braider. (See Figure 2.) In braiding, the yarns

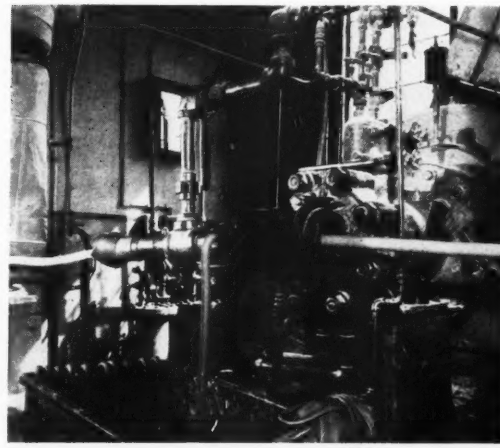


Fig. 3. Tubing Machine with 90-Degree Cross-Head for Hose Covering

[1] Presented before the Elastomer & Plastics Group, Northeastern Section, A. C. S., Massachusetts Institute of Technology, Cambridge, Mass., May 15, 1952.
[2] Boston Woven Hose & Rubber Co., Cambridge, Mass.

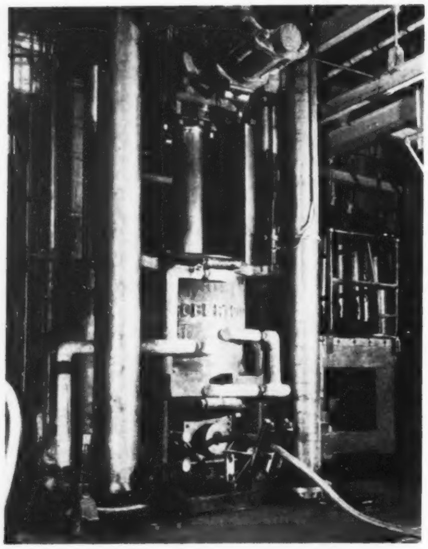


Fig. 4. Lead Press for Applying Lead Sheath before Vulcanizing

are laid on the tube in a manner which gives what might be thought of as a bias woven fabric the length of the hose in which the warp and filler yarns are the same. An appreciable load is put on the uncured tube by the braiding operation, since 24 to 64 spools of yarn are used, depending on the size and the type of hose being made, and each yarn is under from 8-22 ounces spring tension. The first processing requirement for molded hose compounds is, therefore, that the uncured tube stock must be firm enough to prevent the tube from being unduly reduced in cross-section by the load exerted by the yarns of the braider, or that the tube be stretched as it is served into the braider.

Generally one to three layers of braid are applied to a hose tube. In the case of multiple braided hose, a thin layer of calendered stock, which we call backing, is wrapped around the hose between layers of braid to bond the whole structure into one unit in the finished hose. For hose to be serviceable, all components must be firmly bound together in this way, and to accomplish this binding the tube and backing must exhibit good flow and good adhesive properties when subjected to the curing temperature and pressure.

Fig. 5. Removing Lead-Jacketed Hose from Vulcanizer after Curing

After the braid has been applied, the hose is covered with a rubber compound which, in general, has far less exacting processing requirements than the original tube compound. This cover compound need only be a good extruding stock, capable of adhesion to the braid and backing, and be firm enough so that sucessive layers, when placed on a board or truck, will not tend to deform. A dusting of mica is used to prevent successive layers from sticking.

For hose covering, a modification of a standard extrusion machine with a cross-head attached to the end of the barrel of the machine is used, and the stock is extruded at an angle of 90 degrees to the barrel. The hose is carried through the cross-head at right angles to the barrel of the machine, through a hollow spindle, and the cover is extruded around it. (See Figure 3.)

Next the hose is sheathed in lead by a process similar in some respects to that used in applying the cover, but requiring, of course, a metal extrusion system for the lead. The unvulcanized hose passes through a lead press where a continuous sheath of lead is applied, completely encapsulating the hose in virtually a flexible lead mold. (See Figure 4.) As it is extruded, the lead-sheathed

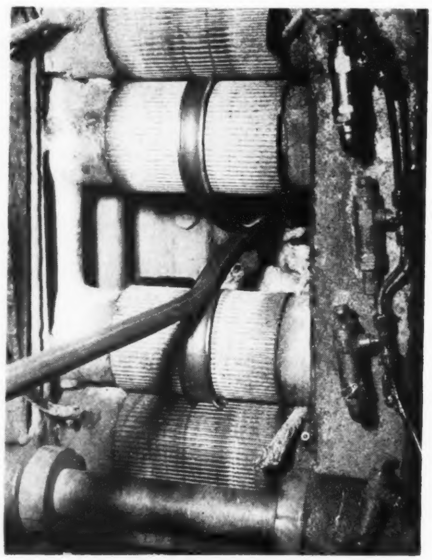


Fig. 6. Stripping Lead Jacket from Molded Hose after Vulcanization

hose is coiled on drums. Water pressure is maintained in the hose during curing which is carried out under 40 or 50 p.s.i. steam pressure in an autoclave. Figure 5 shows the lead-jacketed hose being removed from the vulcanizer after curing, and Figure 6 shows the removal of the lead jacket after vulcanizing.

Compounding

Up to this point this paper has not quite lived up to the title in that very little has been said about compounding for hose. Determining the processing requirements that the compounds have to meet, however, must of necessity always be the first step. Two important requirements, that is, firmness of the tube stock during braiding and proper adhesive characteristics during cure, have already been mentioned. To meet these requirements means the use, in many cases, of high contents of organic resin reinforcing materials, such as mineral rubber, coumarone, etc., as aids to mixing and to give firmness to the

stock when cold, soften it when hot, improve flow properties, and in some instances improve the adhesion of the compound to the yarn in the reinforcing layers.

The use of various elastomers in combination is also very helpful, particularly in tube compounding. Natural rubber and GR-S, for example, both have valuable qualities, but neither is entirely self-sufficient for hose compounding. Natural rubber stocks have good adhesion, but since this elastomer tends to break down so thoroughly during mixing, stocks made from it often lack the desired firmness. On the other hand, GR-S and reclaimed rubber do not break down so much as natural rubber during mixing, but are somewhat deficient in adhesion. In many cases a better balance of properties is obtained, therefore, by the use of both natural and synthetic rubber, or natural rubber and reclaimed rubber.

Some may think that neoprene would be a very good material for hose compounding, since it has the characteristics of being soft when hot and hard when cold. It isn't quite so simple as that, however; sometimes neoprene stocks get too hard and won't set properly on the braider take-off wheel. When neoprene is used, the addition of a small amount of another elastomer which does not crystallize on standing will delay the hardening of the stock. Nitrile rubbers offer problems of another sort. This-type rubber has rather poor adhesion when brought in contact with anything but nitrile rubber, and at times it will not adhere very well to that. The use of various resins is advantageous here.

The cure of vertical braided hose is, by some standards, relatively slow, on the order of 40 minutes at about 40 p.s.i. of steam or at 287° F. These curing conditions, however, permit the use of relatively scorch-free stocks and allow a longer period during which the compounds remain plastic and can flow. Both of these factors improve the adhesion characteristics of the stock.

To a great extent the choice of fillers for these molded hose compounds depends, as with other rubber goods, on the product desired. High loadings of materials such as channel-type carbon blacks are normally avoided since such compounds run hot and nervy and do not extrude well. Softer carbon blacks, such as SRF, for the most part, give acceptable compounds for molded hose; and for light-colored stocks, fillers such as clay and whiting are, of course, used. In addition, the use of clays and whiting in conjunction with the carbon black often gives compounds with better flow characteristics than when blacks are used alone.

In conclusion, brief mention should be made on the compounding of gasoline hose for low-temperature service (40-65 degrees below zero), which is one of the major problems of the moment. In this case the end-requirements of the product overshadow and definitely limit the steps that can be taken to formulate stocks with desirable processing characteristics. In these compounds the use of the ester-type plasticizers is required to secure good low-temperature flexibility. Organic resins must be used with consideration of the fact that most of them reduce the flexibility of the stock at low temperatures. In compounding for gasoline hose for low-temperature service, first, the proper elastomer, oils, fillers and curatives must be chosen so that all service requirements for the product can be met and then means must be found so that the stock will still process satisfactorily.

Relationship between Modulus

(*Continued from page* 219)

tractable matter, it will not fit into a correlation like the ones referred to in this paper. The hydrogen content of this extractable matter is considerably greater than the hydrogen content of the extracted carbon black. Furthermore, the extractable matter covers the surface of the carbon and alters its surface characteristics. Such a carbon black is virtually unwettable by pure water in the method referred to in this paper. P-33 is a typical example of a high extractable matter carbon. Data for it do not correlate with the data for carbon samples with low or neglible extractable matter.

It should probably be pointed out that successful correlation of ultimate analyses with other properties of carbon blacks and of rubber compounds containing them is only possible when the accuracy of the values is considerably greater than is usual in organic anlaysis. This is accomplished by reducing all blanks to a minimum, taking special precautions against all known errors, and using a large initial sample. These analyses can be reproduced to $\pm 0.04\%$.

Conclusions

The correlation of modulus with oil absorption and with Mooney viscosity and ultimate analysis is a strong argument for the colloidal approach to the study of reinforcement. When Mooney viscosity is used in the correlation, the effects of hydrogen and oxygen on modulus are similar to their effects on wettability. This point does not rule out the action of chemical forces since they, too, would be expected to be dependent upon the ultimate analysis of the carbon black. In fact it seems quite likely that both physical and chemical forces must be considered if we are to work out a complete picture of the reinforcement of vulcanized rubber. In this preliminary work the accent has been placed on physical forces, which is probably an over-simplification. The correlation of the data, however, is certainly a strong indication that the physical forces are of tremendous importance.

Acknowledgment

The author wishes to express his appeciation to I. Drogin, of United Carbon Co., Charlestown, W. Va., for permission to use the data in Table 1. The author is also indebted to J. J. Brennan, Lynn Harbison, and others in Phillips Chemicals Co., and to W. B. Reynolds, of Phillips Petroleum Co. for helpful discussions; to J. J. Brennan and members of the Philback Sales Service Laboratories in Akron, O., and to E. W. D. Huffman, of the Huffman Microanalytical Laboratories for data presented in Table 2.

"New Ideas in Cleaning for the Rubber Industry." Oakite Products, Inc., New York, N. Y. 24 pages. The use of detergents for cleaning rubber processing equipment is discussed in this booklet. Topics covered include cleaning of molds, metal preparation for rubber bonding, scale removal from calender rolls and press platens, and others.

Further Extracts from Paley Commission Report on Coal and Petroleum Chemicals and Products Made Therefrom—III[1]

THE following installment continues Chapter 13, a condensation of a study made for the Commission by Gustav Egloff on natural gas and petroleum as industrial raw materials, which was begun in our October, 1952, issue.

Carbon Black Yield Better from Oil

In 1950, 1,382 million pounds of carbon black were produced in the United States, 93% of which was used in rubber. Carbon black requirements for 1975, as shown in Table 2, will nearly double 1950 production. Both natural gas and oil are used to produce the carbon black. Yields from the gas are much lower than those from oil, and the use of oil is gaining ground. The present yield from one gallon of oil is 2.85 pounds, and by 1975 it may be expected to reach at least 3.4 pounds, as shown in Table 3. The furnace black process utilizing oil will undoubtedly supersede processes using natural gas. Oil blacks are superior for many uses. The price is higher, but will drop as the process is developed further.

TABLE 2. RUBBER AND CARBON BLACK CONSUMPTION

Year	Rubber		Carbon Black Requirements
	Long Tons	1,000 Pounds	1,000 Pounds
1955	1,500,000	3,300,000	1,227,000
1960	1,800,000	3,960,000	1,472,000
1975	2,500,000	5,500,000	2,045,000

TABLE 3. CARBON BLACK REQUIREMENTS AND ESTIMATED YIELDS FROM NATURAL GAS AND OIL

Year	Total Carbon Black Requirements, Million Lb.	Natural Gas			Oil		
		Consumption, Million Cu. Ft.	Carbon Black, Million Lb.	Yield, Lb./1,000 Cu. Ft.	Oil Consumed, 1,000 Gal.	Carbon Black, Million Lb.	Yield, Lb. per Gal.
1955	2,000	498,000	1,300	2.61	233,000	700	3.0
1960	2,400	479,000	1,270	2.65	353,000	1,130	3.2
1975	3,575	269,000	715	2.75	842,000	2,860	3.4

In calculations leading to data in Table 3, it is assumed that by 1975, 80% of United States carbon black production will be from oil by the furnace process.

Sulfur Recovery from Gases

Sulfur is being produced from natural and refining gases at a rate of more than 200,000 tons per year. New capacity for recovery will add 100,000 tons per year to this total by the end of 1952. Economics will determine the additional sulfur recovery from these sources. Natural gasoline plants in the vicinity of Odessa, Tex., alone burn at the rate of 500 tons of recoverable sulfur per day.

Present and projected plants range from 10 to 300 tons per day in size. Units as low as five tons per day may be economically sound when integrated with natural gas plants. A freak well, which was shut down because of unprecedented corrosiveness of the gas, was found to contain 42% of hydrogen sulfide and 45 tons per day of sulfur could be recovered from this well alone. There is little doubt that this and many other technical problems can be solved to increase sulfur recovery from these sources.

Important End-Products

Detergents

Detergents in the past five years increased from about 6% to 47% of the total soap-detergent market. Production in 1950 was 1.66 million pounds. The active compounds in detergents, i.e., the surface active agents, comprise 40% of the total weight. Sulfated or sulfonated cyclic compounds, largely from petroleum, are by far the largest class. They are principally derived from benzene and long-chain aliphatic compounds and from selected aromatic gas-oil fractions. Some alkyl naphthalene sulfonates are also made. The nonsulfonated nitrogen containing compounds come from non-petroleum sources except for their ethanolamine content. The polyhydric alcohol esters and ethers are based on animal and vegetable oils and on glycol made from petroleum.

The use of detergents is sure to increase greatly. They will replace a higher proportion of the soap market. Detergent production should be raised to two billion pounds by 1955, 2.5 billion pounds by 1960, and possibly four billion by 1975. These quantities would require 800 million pounds of surface active agents in 1955, one billion in 1960, and 1.6 billion in 1975. Present estimates are that petrochemicals comprise over half the total surface active agents. This will be higher as more benzene is derived from petroleum. Taking benzene, propylene, sulfur, ethylene, and tetradecane as the major petrochemical source materials (though some others will undoubtedly come into the picture), we arrive at the estimate in Table 4.

TABLE 4. PETROCHEMICAL REQUIREMENTS FOR SURFACE ACTIVE AGENTS

(Millions of Pounds)

Year	Total Surface Active Agents	Benzene	Propylene	Sulfur	Ethylene	Tera-decane
1955	800	132	317	82	14	33
1960	1,000	177	422	105	18	40
1975	1,600	304	726	179	22	68

[1] The President's Materials Policy Commission Report of June 23, 1952. U. S. Government Printing Office, Washington, D. C.

Insecticides and Weed-Killers

Chemicals used in insecticides and weed killers come in large part from petroleum and natural gas. Carriers for these chemicals also require large amounts of petroleum oil fractions. The most important consumers of petrochemicals are the two insecticides, DDT and benzene hexachloride, and the plant hormone weed killer 2,4-D (2,4-dichlorophenoxyacetic acid). Production of DDT in 1952 is expected to be 105 million pounds and of benzene hexachloride about 160 million pounds. Production of 2,4-D and derivatives was 28 million pounds in 1950.

The future demand for DDT may rise to 125, 150, and 200 million pounds in the years 1955, 1960, and 1975, respectively. The demand for benzene hexachloride for those years may be 170, 200, and 225 million pounds; for 2,4-D and derivatives, the figures may be 40, 50, and 80 million pounds, respectively. Chemical requirements for these products would then be 162, 194, and 251 million pounds of benzene and 25, 31, and 44 million pounds of ethylene in the years 1955, 1960, and 1975, respectively.

Plastics

Plastics are one of the largest consumers of petrochemicals. As coal tar reaches maximum production, petroleum and natural gas will be relied on for expansion. Plastics have grown from an initial production of less than six million pounds in 1922 to 2.28 billion pounds in 1950. Their chemical components are similar to those used for synthetic rubber and fibers. Plastics production in 1950 was as follows (millions of pounds): phthalic alkyds, 333; non-aromatic alkyds, 69; phenolics, 451; styrene, 356; rosin and rosin esters, 75; urea melamine, 219; vinyls, 381; cellulose acetate, 110; other cellulose, 20; miscellaneous, 267.

Some classes of plastics are growing rapidly and others are leveling off, but, as a whole, the industry can be expected to increase to many times its present size. A total production of 3.5 billion pounds in 1955, 4.8 billion in 1960, and 9.0 billion in 1975, is probable.

The alkyds are used mainly in paints, varnishes, and allied finishes and are based chiefly on phthalic anhydride and glycerol. They are growing in volume, but not spectacularly. A total of 530 million pounds may be produced in 1953, 670 million in 1960, and 1,330 million in 1975. This would require (in millions of pounds) 192, 240, and 480 of phthalic anhydride for each of these years, respectively, and 80, 100, and 200 of glycerol.

The phenolic plastics have their largest use in molding structural materials, but are used also for laminating, adhesives, protective coatings, etc. Demand for 1955 is estimated at 850 million pounds, about double the 1950 production. The 1960 demand may be 950 million pounds. Chemical requirements for the phenol and formaldehyde required and for the benzene and methane from which these would be produced are shown in Table 5.

TABLE 5. CHEMICAL REQUIREMENTS FOR PHENOLIC PLASTICS

(Millions of Pounds)

Year	Phenol	Benzene	Formaldehyde*	Methane
1955	375	346	265	175
1960	475	438	285	224
1975	825	761	495	328

*On a 100% basis.

Polystyrene is used principally for molding materials. It is one of the most rapidly growing plastics. Production in 1950 was 50 times as great as in 1942. Because of synthetic rubber requirements, the supply of styrene was insufficient to meet the demand in 1951, but capacity is being rapidly increased and should reach 750 million pounds in 1952. This would be about 400 million pounds above rubber requirements. Total styrene requirements for 1955 have been estimated at over one billion pounds. It is estimated that styrene requirements for polystyrene plastics alone will be (in millions of pounds) 500 for 1955, 700 for 1960, and 1,500 for 1975. The benzene required for styrene production would be (in millions of pounds) 417 for 1955, 583 for 1960, and 1,250 for 1975; and ethylene required would be 135, 188, and 404, respectively.

Urea and melamine resins, useful for adhesives, laminating, molding, textile, and paper treatment, have grown steadily, but not spectacularly. A production (in millions of pounds) of 265 in 1955, 340 in 1960, and 570 in 1975, can be predicted. Table 6 shows the chemical requirements for this production.

TABLE 6. CHEMICAL REQUIREMENTS FOR UREA AND MELAMINE PLASTICS

(Million of Pounds)

Year	Urea	Ammonia	Formaldehyde*	Methane†
1955	99	99	169	135
1960	143	142	216	175
1975	245	243	363	299

*On a 100% basis.
†Includes methane for formaldehyde and carbon dioxide only for urea; does not include methane for ammonia.

The vinyl plastics are used for raincoats, draperies, upholstery, garden hose, phonograph records, electrical insulation, etc., and they have had a phenomenal growth. Basic raw materials are ethylene or acetylene. Production could reach (in millions of pounds) 700 by 1955, 1,200 by 1960, and 2,000 by 1975. Chemical requirements (in millions of pounds) are for acetylene 323, 554, and 924, respectively, for these years; or for ethylene, 387, 664, and 1,106.

The cellulose plastics have declined in importance. They may not increase appreciably. A total production (in millions of pounds) of 135 in 1955, 150 in 1960, and 175 in 1975 would seem reasonable. Chemicals required would be small in amount.

Among the miscellaneous plastics, the cumarone-indenes, polyethylene, and acrylates are the most important. Cumarone-indenes are used largely as a binder in asphalt floor tile. The acrylates (lucite, Plexiglas) are small in volume, but important in use. Polyethylene is probably the most important of these plastics. Production of miscellaneous plastics should total (in millions of pounds) at least 480 by 1955, 720 by 1960, and 1,700 by 1975. New plastics will, of course, be developed in this period. The cumarone-indene plastics are not made from petroleum sources and are not here considered. Polyethylene production will probably increase (in millions of pounds) to 200 in 1955, 500 in 1960, and 1,000 in 1975. Rough estimates of chemical requirements for these miscellaneous plastics are given in Table 7.

TABLE 7. CHEMICAL REQUIREMENTS FOR MISCELLANEOUS PLASTICS

(Millions of Pounds)

Year	Miscellaneous Plastics	Ethylene	Acetylene	Propylene	Methane
1955	480	225	25	80	30
1960	720	525	40	100	40
1975	1,700	1,100	100	170	75

Petrochemical Requirements for Major Plastics

A comprehensive estimate of petrochemical requirements for important plastics is listed in Table 8.

Table 8. Petrochemical Requirements for Major Plastics

(Millions of Pounds)

Year	Ethylene	Acetylene*	Propylene	Methane	Benzene	*m*-Xylene	Ammonia
1955	747	348	129	340	763	196	99
1960	1,377	594	161	439	1,011	246	142
1975	2,610	1,024	292	702	2,011	491	243

*Partially alternative raw material with ethylene.

These are only part of the total requirements. They are subject to a number of limitations which must be carefully considered in evaluating the estimates.

Plasticizers

Total plasticizer requirements have been projected as 350, 480, and 900 million pounds for 1955, 1960, and 1975. Chemical requirements have been projected for only the largest class of plasticizers—namely, the phthalic anhydride esters. At present other derivatives are produced in greater quantity, but the di-iso-octyl phthalates will probably become most important. Assuming the latter represent the total production, requirements for them will be 210, 288, and 540 million pounds in 1955, 1960, and 1975. To produce these requirements, 70, 95, and 180 million pounds of *n*-heptene will be needed; and if the phthalic anhydride is made from *o*-xylene, 76, 103, and 195 million pounds will be needed.

Solvents

Solvents are among the most important end-uses of petrochemicals. Very few statistics are available, however, on the quantities used. Probably 100 or more different compounds of petrochemical origin are used for this purpose. Many of them are used both as solvents and as intermediates for other solvents. Although a number of the solvents are among the highest tonnage chemicals, the major portion of the production of these chemicals is utilized for other purposes. Requirements, therefore, will be estimated in discussions of major chemical requirements not included in other end-product classifications.

The expected use of ethyl alcohol (the only important solvent on which data are available) as a solvent is projected only to 1962, when requirements are set at 71 millions of pounds.

Synthetic Rubber

Synthetic rubber projections are discussed for GR-S, butyl, neoprene, nitrile-type rubber, and specialty rubbers. Because the chemical constitution of the "true" synthetic rubbers will doubtless be altered somewhat by 1975 to provide better products, only rough generalizations were made about chemical requirements. It was assumed that synthetics in 1975 would be derived principally from normal and isobutylene, acetylene, ethylene, and aromatics. A total of two million long tons (4.48 billion pounds) of synthetic rubber is predicted for 1975. It was assumed that about 85% of the requirements would be for normal or isobutylene, 10% for acetylene or ethylene, and 5% for aromatics. Quantitatively, in millions of pounds, the figures would be 4,231 for normal or isobutylene, 498 for acetylene and ethylene, and 249 for aromatics.

Aromatics requirements, principally benzene, for all synthetic rubbers would run to 319, 355, and 249 millions of pounds in 1955, 1960, and 1975, respectively. C_2 hydrocarbons would run to 193 (for ethylene) and 203 (acetylene) millions in 1955; to 299 (for ethylene) and 262 (acetylene) millions in 1960; and to 706 millions (for the C_2 group) in 1975. (In these estimates, ethylene and acetylene are alternative requirements in some cases.) The butylenes would run to 1,746 (normal) and 232 (iso-) in 1955; to 1,834 (normal) and 417 (iso-) in 1960; and to 4,234 (total) in 1975.

Synthetic Fibers

Synthetic fiber production (exclusive of rayon) for 1960 is estimated at 975 million pounds. By 1975 the estimate rises to four billion pounds. A breakdown of the estimate for individual fibers to 1960 is shown in Table 9.

Table 9. Synthetic Fiber Production (Excluding Rayon)

(Millions of Pounds)

Fiber	1950	1955	1960
Nylon	100	240	300
Orlon	6.5	37	125
Acrilan	None	30	100
Dynel	5	30	100
Dacron	*	35	150
Miscellaneous	45	115	200
Total	....	487	975

*Experimental quantities.

The breakdown for 1975 is as follows (in millions of pounds): polyamides (Nylon), 800; acrylonitrile and copolymers (Dynel), 1,200; polyesters (Dacron), 1,000; miscellaneous, 1,000.

The basic chemical requirements for these synthetic fibers (not including processing chemicals) were estimated in Table 10.

Table 10. Chemical Requirements for Synthetic Fibers (Excluding Rayon)

(Millions of Pounds)

Year	Ethylene *	Ethylene †	Acetylene‡	Acrylonitrile§	Hydrogen Cyanide§	Ammonia	Benzene	*p*-Xylene	Methane¶
1950	21.5	.....	20	9.4	5.3	26.6	147	.....	3.5
1953	102	7	71	86	49	89	353	26.5	23
1960	285	30	248	288	163	183	441	114	108
1975#	1,252	200	1,104	1,000	566	578	1,176	756	373

*Ethylene in this column is alternative with acetylene.
†Ethylene in this column is not alternative with acetylene.
‡Acetylene is alternative with ethylene.
§Acrylonitrile and hydrogen cyanide are not additional requirements. Quantities of raw materials for these compounds are included under the totals for ethylene, acetylene, ammonia, and methane.
¶Methane does not include requirements for making hydrogen for ammonia.
#All 1975 estimates should be considered to represent a class of materials rather than specific compounds.

Rayon production will rise to three billion pounds by 1975. The chemical requirements for rayon, assuming its production to be 70% viscose and 30% acetate, have been calculated in Table 11.

Table 11. Chemical Requirements for Rayon

(Millions of Pounds)

Year	Carbon Bisulfide	Sulfuric* Acid	Acetic† Anhydride	Acetic† Acid	Acetone†	Sulfur	Methane
1953	404	1,616	912	1,596	91	963	94
1960	505	2,020	1,140	1,995	114	1,214	118
1975	798	3,198	1,800	3,150	180	1,901	187

*For both viscose and acetate rayon; calculated for 100% sulfuric acid.
†Ethylene, propylene, and other requirements for these products are included in other calculations.

Other Chemical Requirements

Table 12 gives additional major chemical requirements for 1955, 1960, and 1975 not included in previous end-product classifications. These include additional requirements for methanol and formaldehyde, for methyl chloride, methylene dichloride, ammonia, acetylene, sulfur, ethylene glycol, ethanolamines, ethylene oxide, ethyl alcohol, ethyl chloride, ethylene dichloride, ethylene dibromide, and other ethylene requirements; for propylene, butylenes, higher olefins, benzene, toluene, xylenes,

(*Continued on page* 232)

Editorials

A Warning to the Natural Rubber Industry

AT THE "Natural Rubber Quality and Purchasing Seminars" being held in several of the major rubber consuming centers in the United States from September to January by The Rubber Manufacturers Association, Inc., the statement has been made that the producers of natural rubber have faced competition from synthetic rubber, but have made no improvement in their product.

"It is due to the ingenuity and resourcefulness of the rubber consumer throughout the world that makes possible the successful use of a large share of the producers' output," it was added.

"Where is there another supplier who has continued in business with such customer relations?" it was asked.

A good question—and one which the natural rubber industry in all its branches might well consider seriously.

Actually, the natural rubber producing industry, particularly the British, French, Dutch, Malayan, and Indonesian rubber growers associations, have been carrying on research and development on natural rubber for many years. In the recent past they have also sponsored the development of Technically Classified rubber through their International Rubber Research Board. This development was called "the most outstanding contribution of the natural rubber industry," at the RMA Seminars.

It is in the field of rubber classification, packing, distribution, and technical service to the consumer that the natural rubber industry does not meet competition. It was the consuming industry in this country, starting 24 years ago, that had to develop the RMA-Type Classification system and packing specifications and then sell them to the producing and packing industries. This system does not, however, provide any guarantee of technical quality or uniformity. The producers have been working for the last three years to develop technically classified rubber and a technical classification and testing system to supplement the RMA system, but progress has been slow. Committee D-11 of the American Society for Testing Materials has been working with the International Rubber Research Board on the technical specifications aspect of this project.

Aside from the technical problems that have to be solved, there is the growing need of the producers actually to get out and "sell" their rubber—technically classified or not.

Synthetic rubber in the United States has not had to be "sold" during the postwar years for the reasons that a certain minimum usage was required by our government as a defense measure and more frequently because the synthetic was actively sought after as a replacement for the higher priced and poorer quality natural rubber. In a year or so synthetic rubber may be produced and marketed in volume by several different privately owned companies, if a satisfactory disposal of the government plants can be arranged. Synthetic rubber will then really be sold and serviced in the same manner as other chemical products in this country. Confirmation of this fact is found in a statement in the report of the disposal subcommittee of the Rubber Industry Advisory Committee of the Reconstruction Finance Corp., dated August 19, which states:

"The purchasers of copolymer, butyl, butadiene, and styrene plants will be, of necessity, companies of fairly substantial size because of the investment involved. These companies, however, by the very nature of American industry and by reason of the adequate safeguards provided by law, will be highly competitive, eager to sell any amount of their product to users of either large or small quantities of synthetic rubbers."

Either the producers abroad and/or their dealers in the United States will then have to provide the same kind of selling and service for natural rubber, or their volume of business will suffer materially.

"Natural Rubber News," the publication of the Natural Rubber Bureau, Washington, D. C., in its October issue, has indicated a range of natural rubber usage between 1952 and 1956 that varies from 440,000 long tons to 640,000 long tons in 1952 to 650,000 to 840,000 long tons in 1956. The higher figure is presumably based on a most favorable price. Unless the more favorable natural rubber price is accompanied by improved quality and service to customers, however, synthetic rubber at a somewhat higher price may be more attractive to the consumer except for such uses as large truck tires, drug sundries, belting carcasses, etc., where natural rubber has distinct technical advantages.

A seller's market for natural rubber is a thing of the past. Improved quality, better packing and shipping, technical uniformity, technical service to customers, and even special grades for special uses will soon be the order of the day for natural rubber if it expects to retain its share of the market, not only in the United States, but also in many consuming countries around the world.

During 1951 about 42% of nearly one-half million long tons of natural rubber imported into the United States was off-grade; 11% was non-bona fide tenders. Currently outstanding claims against Far Eastern shippers for off-grade rubber amount to approximately $1,500,000.

It is evident that the rubber consuming industry in this country expects to get what it pays for from now on or use a minimum of natural rubber.

R. G. Seaman

New Developments in Laminac Resins[1]

H. M. Day[2]

AMERICAN CYANAMID CO. produces several classes of polyester resins which are sold under the trade mark, Laminac Resin. Development work is extensive in this field. Many development problems are of the short-range type aimed at specific applications; while others are long range in nature and aimed at future requirements. Two of the long-range developments which we have chosen for discussion are heat-resistant resins (i.e., resins that maintain their strength properties at high temperatures), and fire-resistant resins. Discussions of these two developments follow.

Heat-Resistant Resins

One of the most important resin developments in the low-pressure laminating field has been the introduction of a new series of resins useful in the fabrication of glass fiber reinforced plastic structures having outstanding strength properties at elevated temperatures. This new series of resins contain triallyl cyanurate,[3] herein after referred to as TAC, and it is through the use of this very highly reactive monomer that heat strength properties are obtained.

Flexural strengths of 30,000-40,000 psi. at 500° F. after exposure to this temperature for 24 hours have been obtained on glass cloth laminates made with these TAC-containing resins. When these are compared to the 10,000-20,000 psi. flexural strengths obtained with the best heat-resistant laminating resins previously recommended, the degree of improvement is apparent. Since these resins are new, descriptions and suggestions for use are given below.

Three TAC-containing polyester resins have been formulated, each aimed at meeting a particular handling or end-requirement. Experimental Laminac Resin PDL-7-669 is considered a general-purpose liquid laminating resin useful in making glass fiber reinforced structures having high strength properties at elevated temperatures. Experimental Laminac Resin PDL-7-679 is a solid, crystalline resin which can be coated on to cloth or mat from a solvent suspension to give an impregnated stock easy to handle and which can be subsequently molded to give a heat-resistant structure. Experimental Laminac Resin PDL-7-680 has added fire resistance built into the resin molecule. All three resins have shown excellent heat-resistant and heat strength properties.

Experimental Laminac Resin PDL-7-669

This resin may be described as a clear, non-volatile liquid having a viscosity of 50-65 poises at room temperature. It can be cured with conventional polyester curing catalysts such as benzoyl peroxide and tertiary butyl hydroperoxide. With the possible exception of post curing which may be required to give full strength, no special techniques are required in the use of this resin. Cures can be expected at temperatures below 120° C. and pressures below 50 psi., normal practice in low-pressure laminating.

PROPERTIES. Much is to be learned about this resin since it is still an experimental material. As a guide to possible applications, however, Table 1 lists the physical properties of both the uncured and the cured resin which have been obtained in our laboratory.

TABLE 1. PHYSICAL PROPERTIES OF LAMINAC RESIN PDL-7-669

Uncured Resin	
Appearance	Clear, straw-colored liquid
Viscosity at 25° C., poises	50-65
Refractive index at 25° C.	1.5112
Storage stability:	
Uncatalyzed at 25° C.	Over 6 months
55° C.	Over 5 days
Catalyzed* resin at 25° C.	Over 6 days
40° C.	18-24 hours
55° C.	12-18 hours
Cured Resin† (1/8-Inch Casting)	
Specific gravity	1.346
Shrinkage during cure, % density change	10.5
Refractive index at 25° C.	1.550
Heat distortion point, °C	Approx. 270
Barcol hardness	60-70
Water absorption after 24 hours at 25° C., %	0.39
Flexural strength at 25° C., psi	7,200
Modulus at 25° C., psi	0.75×10^6

*Catalyzed with 1% Luperco ATC (50% benzoyl peroxide, 50% tricresyl phosphate).

†Resin catalyzed with 1% Luperco ATC and cured for eight hours at 120° F., nine hours at 250° F., and two hours at 250° F.

Dielectric properties at 60 cycles were obtained on 1/8-inch clear castings at various temperatures and are shown in Table 2.

TABLE 2. DIELECTRIC PROPERTIES AT VARIOUS TEMPERATURES

Temp., °F.	Dielectric Constant	Dissipation Factor
79	3.97	0.016
167	4.25	0.013
250	4.31	0.009
302	4.22	0.007
356	4.14	0.006
439	4.10	0.012
460	4.31	0.027

The two most striking properties of this resin, when it is compared with conventional polyester resins, are the exceptionally high distortion temperature of the cast resin and the uniform dielectric constant and dissipation factor over such a wide temperature range. It is

[1] Based on a paper presented before the Reinforced Plastics Division, Society of the Plastics Industry, Inc., Chicago, Ill., Apr. 9, 1952.

[2] Plastics laboratory, American Cyanamid Co., Stamford, Conn.

[3] United States patent No. 2,510,564, assigned to American Cyanamid Co.

believed that the constant dielectric properties are due, in part, to the high heat distortion point.

LAMINATING TECHNIQUE. While Resin PDL-7-669 shows exceptional cast resin properties, it will probably find greatest application as a laminating resin. Most of the laminates made in our laboratory were prepared with glass cloth to give optimum heat strength properties, and a definite procedure was used in making these laminates.

The glass cloth was cut into the size desired, and each layer of cloth saturated with resin catalyzed with 1% Luperco ATC. Saturation was performed by pooling the resin in the middle of the cloth and then distributing it evenly over the cloth. This process was repeated with each layer of cloth until the desired number of plies was obtained. In our work 11 plies of cloth were required to make the ⅛-inch thick flat laminate used in the physical testing work. The uncured laminate was then placed between cellophane sheets and pressed between ⅛-inch shims for ½-hour at 105° C. and 50 psi. pressure. The cured laminates were hard, rigid, and easily handled directly from the press.

While a laminate made by this procedure has good strength properties, these properties can be greatly improved by post-curing. A typical Fiberglas 181-114 cloth laminate, as taken from the press, showed a flexural strength of 31,500 psi. at room temperature. Post-curing for three hours at 500° F. increased the flexural strength to 46,800 psi. Obviously post-curing will be desirable or necessary for many applications.

EFFECT OF CLOTH FINISH. Most of the laminates made with Laminac PDL-7-669 employed ECC 181-114 Fiberglas cloth. This cloth was specified by the Air Force for making heat-resistant laminates and had been used in previous evaluation work. We had heard of the improvement in strength properties obtained from similar-type cloth treated with Garan, Bjorksten, or Owens-Corning 136 finishes, but at the time these laminates were made the finishes were still experimental and available only in limited quantities.

PDL-7-669 laminates made with cloth using two of the new finishes, Garan and Owens-Corning 136, have shown improved high-temperature flexural strength properties. We have not evaluated the Bjorksten finish cloth as yet. Table 3 shows flexural strength data on two of the new finish cloths in comparison with conventional 181-114 finish cloth.

TABLE 3. EFFECT OF GLASS CLOTH FINISH ON LAMINATE PROPERTIES

	181-114 Fiberglas Chrome Finish	181 Cloth Garan Finish	131-38 Cloth Owens-Corning 136 Finish
Resin content of laminate, %	41	37.2	42
Flexural strength, psi.:			
At 25° C.	31,500	41,900	39,200
500° F. after aging at 500° F. for:			
½-hour	25,700	28,400	......
3 hours	27,200	34,700	30,300
24 hours	32,800	39,800	......
Flexural modulus, x 10^6 psi.:			
At 25° C.	2.4	2.33	......
500° F. after aging at 500° F. for:			
½-hour	2.4	2.34	......
3 hours	2.15	2.15	......
24 hours	2.48	2.02	......

NON-CLOTH LAMINATES. Most of the heat-resistant laminates tested were made with glass cloth. In actual fabrication, however, particularly if complex shapes are made, it may not be possible to use glass cloth. Glass mat or chopped glass fiber may also be used. Glass mat laminates made with PDL-7-669 show the following properties:

Resin content of laminate, %	67
Flexural strength, psi.:	
At 25° C.	21,000
500° F. after aging at 500° F.:	
For 3 hours	14,700
24 hours	13,000

Improvements in the mat sizings, similar to those accomplished for cloths, can be expected further to increase these strength values.

HEAT STRENGTH PROPERTIES. Most of the heat strength properties previously given were obtained at 500° F. It is fairly certain, however, that if the 500° F. requirements are met, resins that withstand even higher temperatures will be needed. In anticipation of this need, some limited work has been carired out on PDL-7-669 glass cloth laminates at higher temperatures. Our present physical testing equipment is not suitable for flexural strength determinations at temperatures above 500° F.; so it has not been possible to obtain comparable data. However laminates have been exposed to temperatures of 550 and 600° F. for ½-hour and four hours. Calculated resin losses after such exposures were as follows:

Resin content of laminate, %	41
Calculated resin loss, %:	
After ½-hour at 550° F.	3.5
600° F.	14
After 4 hours at 550° F.	24
600° F.	62

The above data indicate that Laminac PDL-7-669 laminates will withstand temperatures above 500° F. for short periods of time. At 600° F. the loss in resin content is quite rapid.

Experimental Laminac Resin PDL-7-679

For some types of fabrication it may be advantageous to utilize a solid, crystalline-type resin which can be coated on to cloth or mat from a hot melt or suspension to give a relatively dry impregnated stock that is easy to handle. Experimental Laminac Resin PDL-7-679 has been formulated for this purpose. This resin is very similar to PDL-7-669, but is a waxy, crystalline solid with a melting point of approximately 185° F.

As the result of a limited amount of work with this resin, the following method of application is recommended for impregnation. A 50% solids suspension is made by agitating the solid resin in an equal weight of acetone or methyl ethyl ketone. This suspension is thixotropic; i.e., it is almost solid when allowed to stand without agitation, but becomes fairly liquid when stirred. The catalyst, 1% Luperco ATC, is then added and dissolved, and the finished suspension placed in an impregnation tank. Cloth or mat is run through the suspension, and squeeze rolls are utilized to control the resin content of the impregnated stock. An impregnation speed of 0.8-foot per minute was used with the laboratory equipment, and the impregnated stock run through an infrared dryer to remove the solvent.

Care must be taken to use the lowest temperature practicable in solvent removal so as to prevent premature polymerization of the catalyzed resin. The dried impregnated cloth is practically tack-free and can be rolled between cellophane separator sheets for shipping. Combining equal parts of PDL-7-679 and PDL-7-669 in the impregnating solution gives a tacky sheet that may be desirable in some lay-up applications. Stability tests on materials impregnated with PDL-7-679 are not complete, but the materials can be expected to remain in usable condition for a number of months if temperatures of 104° F. or higher are avoided.

Laminates made with 12 plies of ECC 181-114 Fiberglas cloth impregnated with Laminac PDL-7-679 to 45% resin content, pressed at 50 psi. pressure between shims, and cured for ½-hour at 105° C. showed a final resin content of 38%. Laminate properties were as follows:

	Flexural Strength, Psi.
At 25° C.	33,000
500° F. after aging at 500° F. for:	
½-hour	25,800
3 hours	33,100
24 hours	29,000

Experimental Laminac Resin PDL-7-680

Resins PDL-7-669 and PDL-7-679, while possessing excellent heat resistance, are not fire resistant. A limited amount of work has indicated that Experimental Laminac Resin PDL-7-680, a modification of PDL-7-669, possesses fire resistance with no sacrifice of flexural strength properties at 500° F. Resin PDL-7-680 may be described as a white, opaque, non-volatile liquid polyester resin having a viscosity of approximately 150 poises. This resin can be used to make glass cloth laminates that have good strength properties at 500° F., and these properties can be greatly increased by post-curing at 500° F.

The following flexural strength data were obtained on an 11-ply laminate of PDL-7-680 with Fiberglas 181-114 cloth. As in the previous work, a 1% Luperco ATC catalyst and a cure cycle of ½-hour at 105° C. were used in making these laminates.

Resin content of laminate, %	31
Flexural strength, psi.:	
At 25° C.	37,500
500° F. after aging at 500° F. for	
½-hour	24,600
3 hours	30,000
24 hours	35,000

These strength values are quite comparable to those obtained with Fiberglas 181-114 cloth laminates made with non-fire-resistant PDL-7-669 resin.

Fire resistance is a misleading term unless defined. As generally used in the polyester field, fire resistance does not mean that the plastic will not burn. Rather, it means that a sample of plastic will be self-extinguishing after exposure to a flame for a definite period of time.

In determining whether a resin is fire resistant or not, an Underwriters' Laboratory approval test is used. Briefly, a 1 by 9 by 3/32-inch sample of glass mat laminate of the resin being tested is suspended at a 45-degree angle so that one inch of the laminate is exposed in a five-inch flame from a Bunsen burner. The sample is exposed for 30 seconds, and the flame then removed. To be fire resistant the exposed laminate must be self-extinguishing in less than 20 seconds. Glass mat laminates made with Laminac PDL-7-680 were self-extinguishing in less than two seconds. In comparison, neither PDL-7-669 glass mat nor glass cloth laminates are self-extinguishing.

Resin Applications

Applications for these three new TAC-containing Laminac resins will undoubtedly suggest themselves more clearly to fabricators than they do to resin manufacturers. In general, these resins appear suitable for use in clear and filled castings, and glass fiber reinforced laminates or moldings where some combination of the following properties is desired:

(1) High heat distortion point.
(2) Good high-temperature stability.
(3) Low degree of change in electrical properties over a wide temperature range.
(4) Fire resistance.
(5) High degree of chemical and solvent resistance.

It should be recognized that these three TAC-containing resins are experimental materials. At present they are costly and available only in limited quantities. If demand warrants, they could become available at lower costs although it is expected that prices will remain substantially higher than for the more conventional polyester resins.

Fire-Resistant Resins

In addition to Resin PDL-7-680 previously described, another development of interest is a general-purpose heat- and fire-resistant formulation, Experimental Laminac Resin PDL-7-676. It is well known that flame-resistant properties can be obtained in polyester resins by incorporating relatively large amounts of certain chlorine-containing compounds. This technique, while giving adequate fire resistance for many applications, fails in other applications. The physical properties of the resin are usually impaired by the addition of these inert chlorine-containing compounds. Since these compounds are not chemically combined with the resin, they will "sweat out" upon long standing or volatilize upon heating.

Experimental Laminac Resin PDL-7-676 has been developed as a flame-resistant resin having improved physical properties. It contains practically no uncombined chlorine compounds which can act as plasticizers and be lost upon aging. Table 4 compares the physical properties of cured castings of PDL-7-676 with Laminac 4115; the latter was taken as a typical intermediate polyester formulation.

TABLE 4. PHYSICAL PROPERTIES OF LAMINACS PDL-7-676 AND 4115

	Laminac PDL-7-676	Laminac 4115
Barcol hardness	40	50
Tensile strength at 25° C., psi	9,100	8,300
Flexural strength at 25° C., psi	12,300	12,400
Modulus at 25° C., x 10^6 psi	0.60	0.68
Heat distortion point, °C.	114	93
Water absorption, 24 hours at 25° C., %	0.18	0.17
Shrinkage during cure, %	5.7	6.8
Specific gravity	1.35	1.2
Fire resistant	Yes	No

Typical 3/32-inch thick glass mat laminates made with PDL-7-676 were immediately self-extinguishing after exposure for 30 seconds to a Bunsen burner flame five inches high with a 1½-inch blue core. This self-extinguishing property was maintained even after 90 days' exposure to 150° C. heat. There was also very little change in flexural strength of these laminates over this heating period; initial flexural strength was 18,300 psi., and aged strength was 20,900 psi. This maintenance of fire-resistant and strength properties after heat exposure exemplifies the stability of this resin.

Paley Report

(*Continued from page 228*)

cresylic acids, and naphthenic acids. The table gives a condensed picture of the quantities estimated for the specified items listed.

TABLE 12. MAJOR CHEMICAL REQUIREMENTS NOT INCLUDED IN OTHER END-PRODUCT CLASSIFICATIONS

(Millions of Pounds, Unless Otherwise Indicated)

	1955	1960	1975
Formaldehyde (100% basis)	675	810	1,290
Methanol	1,500	1,800	2,870
Methane	580	720	965
Methyl chloride	*55 (19)	*80 (28)	*120 (42)
Methylene dichloride	*60 (14)	*75 (18)	*120 (28)
Ammonia	*5,200 (4,100)	*6,400 (5,000)	*10,400(8,100)
Acetylene	859	1,525	3,914
Sulfur	13,884	17,391	27,634
Ethylene glycol	†558 (457)	†670 (549)	†900 (737)
Polyglycols and ethers	61	67	87
Ethanolamines	†50 (42)	†61 (51)	†116 (97)
Ethylene oxides	†(46)	†(61)	†(123)
Ethyl alcohol (millions of gallons)	†285 (1,375)	†390 (1,882)	†700 (3,378)
Chloride	†(230)	†(320)	†(575)
Ethylene dichloride	†(81)	†(111)	†(195)
Dibromide	†(38)	†(45)	†(70)
(Miscellaneous purposes)	115	160	275
Propylene	1,115	1,460	2,545
Butylenes and isobutylene	204	223	466
Higher olefins	30	95	200
Benzene	1,152	1,452	2,660
Toluene (exclusive of military requirements)	495	635	1,060
Xylenes	400	550	900
Cresylic acids	90	115	175
Naphthenic acids	35	45	75

*Methane requirements in millions of pounds in parentheses.
†Ethylene requirements in millions of pounds in parentheses.

(*To be continued*)

Meetings and Reports

SPE Conference Theme Chosen; Report on Section Meetings

"PLASTICS—Engineered for Tomorrow" is the theme for the ninth annual National Technical Conference of the Society of Plastics Engineers, Inc., to be held at the Hotel Statler, Boston, Mass., January 21-23. Plastics engineers from all over the United States and Canada, as well as from many foreign countries, are expected to attend the conference which will feature speakers from all fields of the industry.

Conference committee officers are as follows: general chairman, John W. LaBelle, Koppers Co., Inc.; co-chairman, J. F. Lang, Bakelite Co.; secretary, M. S. Haas, Bolta Products, Inc.; treasurer, R. W. Beckwith, Dow Chemical Co.; and sergeant-at-arms, A. A. Staff, Koppers. Subcommittee chairmen are: printing, R. A. Mazur, American Cyanamid Co.; registration, reservations, and information, J. G. Fuller, Jr., Hercules Powder Co.; company registration, G. W. Martin, Noma Electric Corp.; program, J. T. Moore, Tennessee Eastman Corp.; speakers, Arthur Logozzo, Nutmeg Chrome Corp.; ladies' entertainment, F. H. Langhorst, Stanley Chemical Co.; house, luncheon and banquet, J. F. Lang, Bakelite; reception, L. J. Pentland, Durez Plastics & Chemicals, Inc.; prize papers, R. C. Davenport, Gregstrom Co., Inc.; favors and prizes, Richard Bruce, Bakelite; and publicity and advertising, F. C. Dooley, H. Muehlstein & Co.

Mold Engineering and Costs

Two talks on "Engineering and Cost Factors in Mold Building" featured the October 15 dinner-meeting of the New York Section, SPE. Some 100 members and guests attended the meeting, held at the Gotham Hotel, New York, N. Y. Featured speakers were Section Director Saul Blitz, Noma Electric Corp., and Section President Bruno E. Wessinger, Wess Plastic Molds, Inc. As an added feature, there was also a short talk on "Molding and Moldmaking in Europe" by Harry Meklembourg, Progressive Plastics Mfg. Co., who recently returned from a trip abroad.

Speaking from the viewpoint of the injection molder, Mr. Blitz emphasized that as long as we use machines that have tremendous molding and clamping pressures, we must build molds strong enough to withstand these pressures. The real profit for molders lies in making substantial molding runs, not in savings on the initial mold purchase price. The most economical mold is one that continuously produces acceptable parts in the shortest time, with a minimum of maintenance and the least degree of operator skill and machine set-up. Such a mold is the result of proper engineering by molder and moldmaker.

Upon receiving a sample or drawing of a proposed new part, the molder should give due consideration to possible methods of molding the part, further simplification of the part, the molding material to be used, expected tolerances, function of the part, acceptable quality, and expected production during the first year. The molder must also decide on the number of mold cavities after considering his machine capacity in the material to be used, and the surface area of the part. At this stage the molder is ready to select a moldmaker, bearing in mind that most moldmakers specialize in one type of mold or method of mold construction.

Mr. Blitz stated that the molder, after selecting the moldmaker, should then discuss with him the type of mold, parting line, gate location and dimensions, ejection method and location, type of sprue bushing, cold slug and runner dimensions, cooling pattern, vent location and dimensions, draft and tapers, mold supports, allowable shrinkage, mold finish, and mold construction material. The speaker noted that the selection of the mold material should properly be the responsibility of the moldmaker. Since the molder must live with the mold, it is up to him to supply the moldmaker with as much information as possible. A mold that hangs up during ejection for as little as two seconds in a 30-second cycle can cause an eight-hour production loss in a week.

Mr. Blitz also pointed out that many molders tend to shy away from the unconventional injection mold or part and said that the industry has much to learn from the die casting field with regard to complicated molds. Properly designed cam molds, air cylinder core pulls, and unscrewing devices can save money both for molders and their customers, the speaker emphasized, and showed samples of parts molded by such methods to illustrate this point.

Mr. Wessinger discussed the subject from the viewpoint of the moldmaker. Some of the points he mentioned were the need of meeting molders requirements; the need of samples to provide quicker and more accurate estimates of mold building costs than can be made on the basis of drawings; the different mold contruction materials and their uses; the effect of tolerances and mold polishes on mold costs; and the need of building the mold to suit the molding material to be used.

Mr. Meklembourg stated that compared to the United States, the plastics industry in western Europe is still in its infancy. With the exception of England, France, Germany, and Italy, molding is practically non-existent. About half the injection machines in use are hand-operated, and a machine of eight-ounce capacity is considered very large. In France most injection molders have two or three machines, with a total capacity of about 15 ounces. Molds are generally of the one- or two-cavity type; no cast molds are in use, and little mold hobbing is employed. Mold costs are 50-60% below those in the United States because of very low labor costs. The speaker emphasized that having molds built abroad is a hazardous undertaking because of metric system confusion, the need of samples of products, the need of exactly specifying all mold construction elements, and the practical impossibility of obtaining replacements in this country.

In the business session preceding the talks, a report on the recent meeting of the Society's national directors was given by Stanley Bindman, Jamison Plastic Corp. Mr. Wessinger announced that the local Prize Paper Contest will be handled by George Baron, Ideal Plastics Corp. Mr. Wessinger also appointed the following nominating committee to select a slate of candidates for Section directors: G. P. Humphrey, RC Molding Co., chairman; R. M. Thews, Monsanto Chemical Co.; S. S. Stone, Nordan Plastics Corp.; H. J. Weber, Waljohn Plastics, Inc.; and Guy Martinelli, Sylvan Plastics, Inc. Table favors were distributed through the courtesy of R. F. Berentsen, Rohm & Haas Co., and the meeting closed with a drawing for door prizes contributed by Harold Schwartz, Empire Brushes, Inc.; Mr. Blitz; and N. V. Fasano, Washington Molding Co.

Films Shown at Chicago

Showings of films on plastics highlighted the September 17 and October 8 joint dinner-meetings of the Chicago Section, SPE, and Midwest Chapter, SPI, held at the North Park Hotel, Chicago, Ill. Some 75 members and guests of the two groups attended the September meeting at which V. E. Serrell, Bakelite Co., gave a brief introduction to his company's new film, "Flight to the Future." The October meeting featured a showing of the Tennessee Eastman Corp. color film on the use of Tenite water pipe in Australia. The film was introduced by John T. Bent, of Tennessee Eastman.

Talk on Synthetic Fibers

The Toronto Section, SPE, began the season with a ladies' night dinner-meeting on September 16 at the St. Regis Hotel, Toronto, Ont., Canada. Speaker of the evening was J. L. M. Thurlow, Canadian Industries, Ltd., who discussed "Synthetic Textile Fibers." There was also a showing of a film, "This Is Nylon."

Mr. Thurlow began his talk by noting that while 50 years ago mankind had only four fibers to choose from, there are now 55 fibers and more on the way. By carefully blending the finest and most desirable properties of these fibers, the textile engineer may be expected to build fabrics to meet any specific need. Suits which are light yet warm, crease resistant, and press-retentive are already on the market and employ only one of the synthetic fibers, Dacron polyester.

"The avalanche of new synthetic fibers hasn't yet been stemmed," Mr. Thurlow said.

In addition to nylon, other man-made fibers which are expected to make a great impact on apparel in the future include Orlon, Dacron, Dynel, Acrilan, and Fiber X51.

Plastics in Business Machines

The Buffalo Section, SPE, held its first regular meeting of the season on September 19 at the Hotel Sheraton, Buffalo, N. Y. The dinner-meeting was a Smorgasbord attended by a large group of members and guests. The technical session was devoted to a talk and discussion period conducted by Frank W. Reynolds, International Business Machine Corp., on applications of plastics in IBM machines.

Plastics used in business machines require extreme precision, minimum dimensional change with variations in temperature and humidity, and maximum wear life, Mr. Reynolds explained. IBM is now using at least 17 different plastic materials

which are fulfilling these requirements. Requirements for specific plastics applications in business machines are: (1) good part design; (2) correct choice of material; (3) proper mold design; and (4) proper molding technique. Violating any of these requirements will result in an unsatisfactory part, the speaker warned.

SPI New England Meeting

THE eighth annual meeting of the New England Section, Society of the Plastics Industry, Inc., was held on October 16 and 17 at the Equinox House, Manchester, Vt. A record total of 215 members attended the meeting whose program blended business sessions and social activities.

The session on October 16 began with a talk on "A Comparison of Motor Freight Rates in the New England Area *versus* Other Territories," by B. A. Butryman, Colt's Mfg. Co. Following this address there was a debate on the subject, "Resolved: That Engineering Know-How in the Field Is More Important to Customer Relations Than Engineering Know-How in the Plant." The affirmative was taken by P. F. Huidekoper, Shaw Insulator Co., and Bernard Thal, Bolta Co.; while the negative was argued by F. V. Murphy, Jr., Standard Plastics Co., and H. C. Simmons, Jr., Hercules Powder Co. F. R. Estabrook, Jr., Northern Industrial Chemical Co. acted as moderator. The day concluded with the Section's annual banquet, which featured an address by the Honorable G. H. Brown entitled, "Wanted—Not Mice, but Men."

The October 17 session began with a panel discussion on high impact polystyrenes by J. S. Whitaker, Bakelite Co.; E. E. Ziegler, Dow Chemical Co.; C. J. Snyder, Koppers Co., Inc.; and R. I. Dunlaps, Monsanto Chemical Co. Talks on "Training Programs for a Career in the Plastics Industry" were given by two speakers, with L. F. Rahm, Princeton University, discussing training at the college level, and R. E. Helmer, Toronto Board of Education, speaking on training at the vocational level. The program concluded with "A Review of the Dow-Tarnell Financial Report" by R. B. Bennett, Dow Chemical.

Social activities during the meeting included a golf tournament, scenic tours, and a separate ladies' program. W. E. Parsons, Keyes Fibre Co., headed the arrangements committee, which included G. W. Carlson, Arrow-Hart & Hegeman Electric Co.; C. J. Cowan, Cowan Boyden Corp.; David Guarnaccia, Monsanto; R. A. Hoffer, General Electric Co.; Otto Morningstar, Morningstar Corp.; G. V. Sammet, Jr., Northern Industrial; J. L. Sholkin, Beacon Plastics Corp.; A. A. Staff, Koppers; W. B. Wallace, Mack Molding Co., Inc.; and G. W. Whitehead, Improved Paper Machinery Corp.

Discuss Film Standard

The proposed Commercial Standard for Vinyl Film, submitted by SPI, will be discussed at a meeting of the vinyl film industry on November 18 at the National Bureau of Standards, Washington, D. C. The meeting will be under the auspices of the Commodity Standards Division, United States Department of Commerce.

The proposed standard covers methods of test and requirements for general-purpose vinyl film to insure satisfactory products for consumer use. The requirements and test methods cover thickness tolerances, yield per roll, width tolerances, shrinkage at elevated temperatures, contamination, appearance, cracking, tensile properties, tear resistance, plasticizer volatility, water extraction, low-temperature impact, and flammability. Suggested forms for declaring compliance with the standard and an identifying hallmark are also included.

CALENDAR

Nov. 19.	Washington Rubber Group. American Standards Assn. Annual Meeting. Hotel Waldorf-Astoria, New York, N. Y.
Nov. 21.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Nov. 25.	Manufacturing Chemists Assn. Semi-Annual Meeting and Winter Conference. Statler Hotel, New York, N. Y.
Nov. 30-Dec. 5.	American Society of Mechanical Engineers. Annual Meeting. New York, N. Y.
Dec. 1-6.	National Exposition of Power & Mechanical Engineering. Grand Central Palace, New York, N. Y.
Dec. 4.	Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.
Dec. 12.	New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y. Detroit Rubber & Plastics Group. Christmas Party. Sheraton Cadillac Hotel, Detroit, Mich.
Dec. 19.	Chicago Rubber Group. Christmas Party. Morrison Hotel, Chicago, Ill.
Jan. 14.	Newark and New York Sections, SPE. Military Park Hotel, Newark, N. J.
Jan. 19-22.	Plant Maintenance Conference and Show. (Special Rubber Industry Sessions, Jan. 20-21.) Public Auditorium, Cleveland, O.
Jan. 19-23.	American Institute of Electrical Engineers. Winter General Meeting. Hotel Statler, New York, N. Y.
Jan. 20.	Elastomer & Plastics Group, Northeastern Section, A. C. S.
Jan. 21.	Washington Rubber Group.
Jan. 21-23.	Society of Plastics Engineers. Annual Technical Conference. Hotel Statler, Boston, Mass.
Jan. 23.	Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Jan. 25-28.	National Sporting Goods Assn. Convention and Show. Hotel New Yorker, New York, N. Y.
Jan. 30.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill. Akron Rubber Group.
Feb. 3.	The Los Angeles Rubber Group, Hotel Statler, Los Angeles, Calif.
Feb. 5.	Northern California Rubber Group.
Feb. 11.	Newark Section, SPE. Military Park Hotel, Newark, N. J.
Feb. 13.	Detroit Rubber & Plastics Group, Inc.
Feb. 17.	Elastomer & Plastics Group, Northeastern Section, A. C. S.
Feb. 18.	Washington Rubber Group. New York Section, SPE. Hotel Gotham, New York, N. Y.
Feb. 18-20.	SPI Reinforced Plastics Division. Shoreham Hotel, Washington, D. C.
Mar. 17.	Elastomer & Plastics Group, Northeastern Section, A. C. S.

Marvinol Output to Double

A PROGRAM to double the production capacity of its Marvinol vinyl resin plant in Painesville, O., has been announced by Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. Expected to be completed by next June, the program will expand production to more than 50,000,000 pounds of resin a year.

According to John P. Coe, vice president and general manager of the division, "Vinyl plastics have been one of the fastest growing segments of the plastics industry, and we have every reason to believe that their spectacular growth will continue."

Mr. Coe cited wall coverings, flooring, and window shades as applications for vinyl which have just moved out of the development stage into large-scale production. Rigid vinyls for pipe, electrical conduits, wire insulation, and other large-volume industrial products; foam vinyls for cushioning and life rafts; and vinyl welting for shoes were mentioned by Mr. Coe as being other fields representing volume potentials.

Naugatuck Chemical has been conducting an intensive research and development program aimed at new types of vinyl resins, and production facilities for these resins are being included in the Painesville expansion program. Tangible results of this development work include Marvinol VR-20, an electrical-grade resin which is easy calendering; Marvinol VR-21, a straight polyvinyl resin which has the processing characteristics of vinyl copolymers; and four new rigid compounds for the manufacture of plastic pipe and other industrial products. Additional resins, such as new dispersion and dry blending resins, are new in the experimental stage and will be introduced in the near future. Several new compounds are also being developed specifically for the extrusion of thin film.

To Occupy New Plant

ANCHOR PLASTICS CO., INC., New York, N. Y., will move to its new 40,000-foot plant in Long Island City during the latter part of November. Equipped with the most modern extrusion and fabrication facilities, the new quarters will enable the company to more than double its present production capacity in order to meet the increased demand for its services.

Midland Plastic Molding Co., manufacturer of Econ-O-Tile plastic wall tile, has moved to a larger plant at 310 Boalt St., Sandusky, O., in a complete separation from the original plant of **Wilson Plastics, Inc.**, also of Sandusky.

Scientific and Technical Activities

Speakers Table—RMA Crude Rubber Quality Seminar Luncheon, New York, October 14. ***(Left to Right):*** **S. H. Sears, Firestone International Co.; Fred C. Havecker, U. S. Rubber; Ralph D. Au; R. B. Bogardus; Walter Krappe; A. L. Viles; W. J. Sears; George Tisdale; E. D. Kelly; Perry S. Odell; C. C. Miller, RMA; and V. Wulff**

RMA Crude Rubber Quality Seminar in New York

THE third of the two-day "Natural Rubber Quality and Purchasing Seminars" sponsored by The Rubber Manufacturers Association, Inc., was held in New York, N. Y., on October 14 and 15 at the Hotel Statler and was attended by about 200 representatives of rubber companies and other interested persons. The program was the work of the Crude Rubber Committee of the RMA, headed by W. J. Sears, and the theme of the conference was "Be Competitive!—Inspect Your Rubber."

The meetings had been held in Akron, O., and Trenton, N. J., prior to the meeting in New York, and further meetings in Boston, Mass., Chicago, Ill., and Los Angeles, Calif., are scheduled before January 1, 1953. Details of the program and dates were given in our September issue on page 794.

The First Day

Mr. Sears presided over the sessions and on the first day began the first session with a talk entitled "Natural Rubber Quality Trends Since World War II and the Functions of the RMA Crude Rubber Committee." Some comments from this paper appeared also in our October issue on page 99, as a result of the meeting in Akron. Two points emphasized at the outset were that the conference was a serious educational effort to promote the use of purchase and inspection standards necessary for the protection of the consumer in buying natural rubber and that the program is a supplementary effort to obtain more widespread understanding and support for the work of the RMA with the rubber trade associations and producing organizations.

The 30 grades of rubber included in the RMA-type descriptions permit the grading of practically all dry crude rubber being produced in the Far East into one or the other of these RMA grades. The issue, therefore, is not so much that the renewed RMA grades are not representative of the rubber now being produced, but is more a question of whether producers and packers in the Far East should ignore the historic prerogative of buyers to determine the quality standards on which they will buy, Mr. Sears declared.

P. S. Odell, United States Rubber Co., next talked on "Various Methods of Purchasing Crude Rubber and the Rules, Regulations and Terms That Apply." It was pointed out that American consumers purchase their crude natural rubber requirements through four channels, as follows: (1) from importing dealer members of the Rubber Trade Association of New York, Inc.; (2) direct from producers and dealers in the Far East; (3) through subsidiary companies in various primary markets in the Far East; (4) through estate agents or dealers in London and Amsterdam.

Different procedures are involved with each of these four channels, and Mr. Odell discussed each and then concluded that better control of inventory and overall commitment position can be maintained in confirming purchases through the first channel under the rules and regulations of the RMA. It was recommended, however, that those companies that have not trained and maintained a staff of qualified crude rubber inspectors do so immediately, in order to provide for their own dockside or factory inspection.

"History and Purpose of RMA-Type Samples and Type Descriptions" was the title of the next talk, by R. B. Bogardus, Goodyear Tire & Rubber Co. The development of RMA official-type samples, started in 1928, which were effective until the advent of World War II, was reviewed. It was then told how the RMA Crude Rubber Committee undertook to renew official RMA-type samples after World War II and has finally been able to make them available. The new samples have been furnished to the various rubber trade associations in all rubber markets of the world.

The combination of RMA-type samples and type descriptions is considered sufficient to enable the natural rubber buyer to determine, with little room for dispute, whether he is being delivered the quality of rubber that has been purchased. In conclusion, Mr. Bogardus stated that it is only with the support of the entire rubber consuming industry in the United States that the progress made so far in obtaining world recognition for this procedure can be maintained and accelerated.

V. Wulff, Firestone Tire & Rubber Co., discussed "Purpose and Effectiveness of RMA Packing Specifications for Natural Rubber." The packing of rubber over the years and the development of bareback bale packing, particularly after World War II, were reviewed. The problem of a suitable bale coating solution, resulting in the present RMA specification in this connection, was also explained.

Rubber packed in strict accord with the RMA specifications should present no handling problems in the consuming plants and will arrive in good condition, easily indentifiable as to grade marks.

Bales out of shape or stuck together on arrival are due to poor stowage aboard ship or to the fact that the packer did not compress the bale sufficiently, it was said.

The chief obstacle to progress toward improved rubber packaging is the complacent willingness of some consumers to take delivery on rubber that is poorly packed. Acceptance of faulty packing without vigorous complaint not only imposes undue cost on the buyer, but it works to the disadvantage of all rubber consumers and conscientious packers by encouraging the guilty packer to continue his slipshod methods as long as he can get away with them, Mr. Wulff pointed out.

"Purpose and Techniques of Natural Rubber Inspection" was the title of the last talk of the first morning session, by Ralph Au, The B. F. Goodrich Co. The procedure of inspection and sampling of rubber was described in some detail by this speaker.

If rubber is found to be not of proper quality, it may still be accepted by the buyer, but usually at an allowance. If the buyer's inspector ignores imperfections in a given lot of rubber and does not obtain proper allowances for them, he is not buying his rubber at the minimum price and is not for that reason competitive with the rest of the industry, it was said.

It was then explained further how, if the parties involved cannot agree on an allowance on a drawn sample of a lot of rubber found to be not up to specifications, they may submit the problem to arbitration by the RMA. The losing party pays for any excess weighing or dock charges caused by the arbitration.

The first-morning session was concluded with a sound movie in color showing the arrival, discharge, weighing, and inspection of natural rubber at the pier.

The Luncheon Session

At the luncheon on the first day there were members of government rubber agencies and the consuming industry present at the head table, as will be seen from the accompanying photograph. Brief talks were made by Walter Krappe, director Rubber Division, National Production Authority; E. Dorrance Kelly, director, Office of Synthetic Rubber, Reconstruction Finance Corp.; George Tisdale, vice president, United States Rubber Co.; and, A. L. Viles, president, RMA.

Mr. Krappe, in his remarks, commented on the improved situation in rubber availability at the present time as compared with two years ago, when the problem was quantity, not quality.

Mr. Kelly reviewed the development of the synthetic rubber industry in the United States from 1941 to date and mentioned that there had also been difficulties with quality and packing of this type of rubber. He revealed that the RFC is now experimenting with the packaging of GR-S in plastic film, a procedure which has been used with butyl rubber for some time. He emphasized that synthetic rubber is sold according to RFC specifications and that all of these factors and the research and development that is carried on in connection with synthetic rubber is done because synthetic rubber can and will be continually improved.

Mr. Tisdale complimented the RMA Crude Rubber Committee on its work and the present seminar program. He said that all factory problems should not be blamed on rubber quality and packing, however, and recommended that the rubber goods industry depend on its technical people to determine which grade of rubber is best suited for a given job. The rubber should then be purchased according to RMA specifications and the recommendations of the user's development department.

Mr. Viles reviewed the development of the RMA specifications which began in the middle 1920's when there were no universal standards of rubber quality and every consumer had his own standards, most of which differed one from the other. The RMA specifications developed by the industry were of great value between 1929 and 1942. After World War II the type-sample campaign had to be started all over again.

It was emphasized that the rubber goods industry in the United States is a mass-production industry and, as such, requires a fairly stable price for its raw materials. Stability of price is to a considerable extent dependent on standardized specifications for these raw materials.

The afternoon was given over to individual examination of RMA-type samples and the quality and packing display.

The Second Day

The program for the second day included a question-and-answer discussion, with a panel of experts on natural rubber procurement, quality, and inspection answering questions submitted in advance and from the floor. Following this feature there was an inspection demonstration in which qualified inspectors examined samples of rubber submitted by those attending the conference and gave their opinion regarding proper grade classification. After luncheon the opportunity to examine RMA-type samples and the quality and packing display was again offered.

The answers to some of the more important questions submitted to the panel were as follows:

Claims can be made if the glue-water type of bale coating is used instead of the RMA bale coating solution.

Color variation in #1, #2, and #3 ribbed smoked sheets is not generally sufficient basis for claims.

Where bales are out of shape, the cost of additional handling should be submitted to the seller with a request for allowance. Rubber dealers usually have insurance which will cover the cost of such allowances.

RMA-type sample books will remain in good condition for seven or eight years if stored out of light and at room temperature.

The arrival of a given shipment of rubber under an RMA contract does not allow for any grace period, but arrival within the three-mile limit by midnight of the last day of the month is all right.

The RMA is not contemplating the establishment of an inspection service available to both the buyer and the seller of natural rubber.

The only figures on the amount of rubber coming into the United States that did not conform to the RMA type contracted for are those collected during the exclusive government buying of natural rubber in 1951 when 41.6% was not according to the RMA grade that was specified.

Regulations for the stowage procedure of rubber bales in ships are not contemplated by RMA at present although conferences with shipping company representatives on this problem will be held. Meanwhile closer adherence to packing and coating specifications should help.

The RMA procedure is a visual inspection procedure only and gives no guarantee of technical uniformity for a given lot of rubber. The RMA Crude Rubber Committee looks with favor on the recent development of Technically Classified rubber as the most significant development in the natural rubber industry at the present time. Natural rubber producers are considered to be more advanced in their thinking than the market people, and the only resistance to technical classification of natural rubber is from those producers who wish to grade rubber improperly. A greater selling effort on the part of the producers of T. C. rubber was suggested.

The inspection demonstration which followed the panel discussion showed that many samples submitted were from ½ to one grade lower than specified.

Chicago Rubber Course

IN A change from its previous announcement (see our October issue, page 91), the Chicago Rubber Group is sponsoring only one course in rubber technology this semester at the Illinois Institute of Technology. The course, CHE 165, Principles of Rubber Compounding—I, deals with natural and common synthetic rubbers, their properties, compounding and processing characteristics, and uses. The course is given two nights per week, consists of two lecture and three laboratory hours, and the instructor is Dr. C. Selheimer, of the Institute.

Vodra on Compounding

A TALK on "Practical Compounding for Economy" by Victor H. Vodra, Wyandotte Chemicals Corp., highlighted the October 16 dinner-meeting of the Quebec Rubber & Plastics Group. Approximately 50 members and guests were present at the meeting, held in the Queens Hotel, Montreal, P.Q., Canada.

Mr. Vodra's talk dealt with a method to enable compounders to know when to change over from synthetic to natural rubber, or *vice versa*, in their formulations. This change-over is a constant problem in view of fluctuating natural rubber prices and the relaxation of regulations restricting the use of natural rubber. The study illustrated how formulae of varying rubber compositions may be developed to meet the same specification at different costs. Stocks with a constant total rubber hydrocarbon loading were made ranging from all-natural to all-GR-S rubber. Cold rubber, oil-enriched GR-S, and reclaimed rubbers were also used in varying proportions, with natural rubber and the resultant properties determined. Finally, all of these elastomers were extended by increasing the loading of fillers, resins, and softeners. Formula costs were studied at different natural rubber prices, and the exact points determined at which shifts from one stock to another should be made.

The speaker pointed out that compounding changes other than the substitution of synthetic for natural rubber were required if the variations in properties of the final stock were to be minimized. By making these adjustments, many of the properties of the original all-natural rubber stocks can be improved as the GR-S portion increases. Properties such as tack were retained throughout the entire substitution system. Stress was laid on the practical approach, and all stocks were adjusted to make them factory processable.

Garvey at Detroit Group

THE fall dinner-meeting of the Detroit Rubber & Plastics Group, Inc., took place on October 3 at the Detroit Leland Hotel, Detroit, Mich. Approximately 200 members and guests heard B. S. Garvey, Jr., Sharples Chemicals, Inc., speak on "The Compounder in the Rubber Industry." Dr. Garvey discussed the functions of the compounder and compounding methods and materials.

In the business session preceding the talk, E. J. Kvet, Jr., Baldwin Rubber Co., vice chairman of the Group's educational committee, presented an outline of two courses in rubber technology which the committee proposes that the Group sponsor at Wayne University. Mr. Kvet asked that the members discuss the program with their management to determine whether the companies would be interested in having their young technical men enroll for these courses, and whether the companies would subsidize all or part of the tuition fees.

Group Chairman G. P. Hollingsworth, Minnesota Mining & Mfg. Co., announced the appointment of a nominating committee for 1953 officers, as follows: E. V. Hindle, United States Rubber Co., chairman; J. B. Ledden, E. I. du Pont de Nemours & Co., Inc.; G. F. Lindner, Minnesota Mining; John C. Dudley, Chrysler Corp.; and G. M. Wolf, Sharples.

Chicago Panel Discussion on Automotive Rubber Products

A PANEL discussion on "Rubber Products Used in the Automotive Industry" featured the September 12 dinner-meeting of the Chicago Rubber Group. Some 153 members and guests attended the meeting which took place at the Morrison Hotel, Chicago, Ill.

S. M. Lillis, Victor Mfg. & Gasket Co., acted as discussion moderator, and panel members were L. E. Calkins, Willys-Overland Co.; A. J. Kearfott, General Motors Corp.; G. W. Lampman, Pontiac Division, General Motors; M. J. Sturtevant, Chrysler Corp.; and Richard Westerman, Ford Motor Co. A report of the discussion follows.

1. Q. Do you have any special problems you have encountered with regard to rubber for automotive parts which should be discussed?

A. Lampman. The most important property for rubber auto parts is durbility in all kinds of weather and service conditions. As a result of our experience we specify butyl rubber for a number of parts due to its good durability.

Kearfott. Important properties which are desired are: improved heat resistance, better oil resistance, dimensional stability, and longer life expectancy for oil seals due to the fact that modern engines work harder and operating temperatures are increasing.

Calkins. The tendency in the automotive industry is to get more and more horsepower out of less and less weight. This produces more headaches for the rubber compounders.

Westerman. We are looking for suppliers to make our factory maintenance parts. The molds and formulas are available to all interested in producing rubber maintenance parts in relatively small quantities.

2. Q. What is the now accepted ozone test method and the equipment for same?

A. Lampman. We use our own designed ozone cabinet. As a result of our tests in our cabinet we have specified butyl for many parts. Some butyl parts will last six months in the cabinet; whereas similar parts from other elastomers will last only three hours.

3. Q. How objectionable are contact stains on automobile bodies caused by rubber parts?

A. Kearfott. We do not permit visible stains of any type.

Lampman. It is hard to tell a contact stain from a migrating stain. Since it may take several years for a migrating stain to develop fully, and we cannot be sure how serious a small stain will become later on, we reject all parts which stain, no matter how slightly.

4. Q. What are the causes of stain in automotive rubber products, their effect on the auto finish, and how can they be eliminated?

A. (At the request of members of the panel, the moderator called on H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Co., to answer this question.)

Winkelmann. The amount of staining depends on whether the finish is an alkyd or nitrocellulose lacquer type. The nitrocellulose finishes usually stain more than the alkyd type. Of the elastomers used, natural rubber causes no trouble; while synthetics and reclaim will cause trouble if they contain staining antioxidants, but not if non-staining antioxidants have been used. Certain types of compounding ingredients such as carbon blacks, softening oils, and antioxidants will stain; while others will not. It is up to the compounder to select the non-staining ingredients.

5. Q. What do you think of the use of butyl or butyl reclaim in a GR-S stock to improve the ozone and suncheck resistance of the stock?

A. Lampman. Do not mix the two under any conditions. The mixture will only cause trouble. Butyl can be mixed with neoprene, but only in small percentages. A hint to laboratory men is to be sure your mills are thoroughly clean before making samples, or the butyl will be contaminated.

6. Q. Which do you consider the best adhesives for rubber-to-metal adhesion in the automotive industry?

A. Westerman. For motor mounts we prefer the brass-plated type because the quality of the bond has been more consistent; however, we will accept the chlorinated rubber type if they pass our Sonntag fatigue test. For other parts, such as accelerator and brake pedals, the brass-plated type is best, but we can and do use the chlorinated rubber type. For rubber to painted bodies, such as weatherstrip to body, it is possible to use many types. The most important requirement for this usage is that the adhesive must not be thermoplastic in use condition; that is, it must not soften in paint repair ovens or at temperatures encountered in southern states.

7. Q. What do you consider as the most important defects in the present automotive mechanical rubber products?

A. Calkins. The greatest defect is inconsistency in product quality or inability to meet any specification consistently. We feel this is due to improper supervision. It is a mistake to let statistical quality control take the place of adequate supervision.

Lampman. The greatest defect in butyl parts is undercuring since an undercured butyl compound will crack on exposure to ozone.

8. Q. How can companies not having Detroit representation quote on automotive business?

A. Kearfott and **Lampman.** A company without Detroit representatives should have no trouble getting business. All they need to do is contact the proper parties at regular intervals. Keep coming back, but not too often. Say about once a month—and don't call on a Monday morning.

9. Q. Why do many blueprints for rubber parts show metal tolerances which cannot be held with rubber?

A. Sturtevant. Drafting departments are sometimes negligent. It is easier for them to rely on the ±0.010 note that appears on all printed tracing cloths. In general where tolerances are necessary, they are applied; where not, they are left off.

10. Q. What elastomer do you consider best for radiator hose, and explain your choice?

A. Westerman. We are using both butyl hose and a hose fabricated with a neoprene tube and a fabric-reinforced reclaim cover.

Lampman. Butyl is by far the best.

11. Q. Is there more than the usual amount of detrimental rays in our atmosphere to cause so much more sun checking than seems to have been experienced in years past?

A. Westerman. No. The principal reasons why we have more sunchecking are thought to be the following: The design of rubber parts is somewhat different than it was ten years ago. Corners of rubber parts are more rounded, and the parts are usually stretched when they are put around these corners. Some parts which were formerly molded are now extruded. Then, too, the rubber parts are larger, and the defects are easier to see.

12. Q. How do you check and inspect your incoming rubber parts to ascertain their conformance to standards set by original parts that passed the performance test?

A. Calkins. After the part from the supplier is approved, it is necessary to set up a test that can be made in 48 or 72 hours so that production is not held up checking incoming shipments. A common quality control basis is to test four pieces in a shipment; if one fails, to take eight more and test them. The fate of the shipment rests on the 12 pieces tested. The specification set up is a minimum and must be met.

Sturtevant. We have a physical testing laboratory in each plant and in addition roving inspectors from the central laboratory who make spot checks and run life tests on their spot checks.

Kearfott. Oil-resistant synthetics present somewhat of a problem. It is necessary to use several different tests, such as volume change in ASTM test oils, compression set, dry heat aging, a bend test, tensile, elongation, and hardness.

13. Q. What automotive applications are requiring the use of high-temperature rubbers like the silicones?

A. Calkins. There are not many, although there should be more in the future. The silicones will probably be used for oil seals which must stand 250-350° F. or more.

Sturtevant. The only application we know about is the O-ring seal in the fluid coupling. In general, the silicones are too high in price.

Kearfott. We have some applications where silicones are necessary because of the high temperatures involved; however, we have to be careful that certain oils at elevated temperatures do not come in contact with some silicone compounds, especially if they are grossly undercured.

14. Q. What difficulties can be encountered when two suppliers use different ingredients to prepare compounds that both meet a particular specification?

A. Kearfott. We do not give chemical formulas except on special occasions. We leave it up to the supplier as to what ingredients are used. At present we are interested only in having the parts meet the specification.

15. Q. What elastometer should be used, and what properties should the compounds have to make good motor mounts and shock absorber bumpers?

A. Calkins. We do not care what elastometer is used so long as the parts meet the specifications.

Westerman. Right now we are using neoprene in the rear motor mounts of the automatic transmission cars, natural rubber in the front motor mounts, and GR-S or natural rubber in the shock absorber bumpers.

16. Q. Is there any new technique in the compounding and manufacturing of auto floor mats?

A. Sturtevant. A new technique which has just been developed is to use a black rubber base and bond to it a vividly colored top coat of rubber.

17. Q. What properties are needed

in compounds for mud guards now required on trucks by law in the State of Illinois?

A. Sturtevant. We are not familiar with this usage; however, we would suggest a cloth reinforcement, with the rubber stock having about 70 durometer and 1000 psi. tensile strength.

18. Q. When an automotive firm develops a rubber compound and molding technique for a certain job, why don't they send the recipe and procedure out with the invitation to quote?

A. Westerman. We do not develop recipes for automotive parts, but depend on our suppliers to do that.

Kearfott. We have developed recipes and discussed them only for special products. We prefer to let our suppliers develop their own recipes and processing techniques. We believe we get better materials this way.

Sturtevant. If we were to develop recipes, it would only complicate the procedure. We sometimes suggest a recipe, but if we do, we tell the supplier to work on it and make his own modifications.

Calkins. A word to the salesmen of suppliers is in order here. They should make sure that they know what the specifications mean before they take them back to their laboratories.

Lampman. We will give as much recipe information as we can if it is desired, but such information is already available in the literature.

19. Q. Is the automotive industry doing anything to improve the safety of passengers in the cars of the future?

A. Kearfott. Safety and comfort are constantly stressed by the design departments and by the stylists.

Pollack and Freeman Boston Group Speakers

THE fall meeting of the Boston Rubber Group held at the Somerset Hotel, Boston, Mass., on October 17, heard a talk by M. A. Pollack, technical consultant, on "Plasticizers for Elastomers," and one by L. M. Freeman, B. F. Goodrich Co., on "Application of Statistical Quality Control in a Rubber Factory." About 400 members and guests were present.

A. W. Bryant, Binney & Smith Co., acting chairman of the Group, presided and read a letter from John Andrews, Godfrey L. Cabot, Inc., written in August, 1952, in which Mr. Andrews resigned as chairman of the Boston Group because of his transfer to England by the Cabot company.

C. R. Haynes, Binney & Smith Co., secretary of the Division of Rubber Chemistry, A. C. S., mentioned the program for the Buffalo, N. Y., meeting of the Division on October 29-31, and also the Boston meeting, May 27-29, 1953. He emphasized the need of papers for the Boston meeting to the local group members and suggested their consideration now of possible subjects that they might present in May.

H. S. Royce, Boston Woven Hose & Rubber Co., called the attention of the group to the RMA Natural Rubber Seminar to be held in Boston, October 21 and 22, and urged that those interested plan to attend.

Dr. Pollack's talk on plasticizers was similar to that given before the Connecticut Rubber Group in May and reported in our June issue on page 384. It was pointed out that the suitability of plasticizers for low-temperature flexibiliy can be predicted from the characteristics of compatibility, viscosity, and viscosity index. This paper will be published in a future issue of India RUBBER WORLD.

Mr. Freeman first explained that the application of statistical quality control in a rubber factory has been through the physical testing laboratory where the laboratory-size equipment similar to factory-size equipment provides the same type of problems to solve as are experienced in factory operations. It was said that by use of statistical quality control in tensile testing, the number of samples tested was reduced to an extent that more than paid for the extra cost of the quality control work.

Improved quality of workmanship was obtained in the compounding room by check weighing of the number of batches of the total, as prescribed by statistical quality control tables, and if the batches weighed fell within the three sigma control limits, the whole lot was released for further processing. If any of the sample batches were not within the three sigma control limits, the batches represented by these samples were torn down, and each weighing was rechecked. If and when these batches were found within the control limits, the whole lot could be released. This same procedure was also applied to the gaging of test specimens for tensile and stress-strain testing. Press temperatures during curing were also sampled according to statistical quality control and charted against the temperature prescribed.

Through the experience gained in the use of statistical quality control methods in the physical testing laboratory, these methods were applied to factory production problems, and examples of several factory applications were described.

The meeting was concluded with the showing of the Natural Rubber Bureau's sound movie "Stretching Highway Dollars with Rubber Roads."

Joint Meeting at Akron

SOME 600 members and guests of the Akron Rubber Group and the Cleveland-Akron Section, SPE, attended a joint meeting on October 17 at the Mayflower Hotel, Akron, O. The afternoon technical session consisted of a symposium on "Vinyl Compounding and Processing." A transcript of the symposium will be published in a future issue of India RUBBER WORLD. J. C. Richards, B. F. Goodrich Chemical Co., acted as moderator of the discussion, and panel members were K. K. Fligor, Goodyear Tire & Rubber Co.; B. K. Lyckberg, Firestone Tire & Rubber Co.; R. A. Mansfield, Goodrich Chemical; Frank Martin, Hoover Co.; D. J. Siddall, U. S. Stoneware Co.; and Frank Steere, Steere Enterprises.

The afternoon session was followed by a social hour and dinner at which William O'Neil, president and board chairman of The General Tire & Rubber Co., gave a talk on "Rubber and Plastics Today." Plastics have opened up a new frontier for the rubber industry, Mr. O'Neil said. The rise of these materials has enabled rubber firms to create new products and develop new business. The speaker, who predicted an unlimited future for man-made materials, said that vinyl film and sheeting will eventually be cheaper than cheesecloth. In discussing synthetic rubber, Mr. O'Neil declared that it is now better than natural rubber for 55% of all applications and predicted that it will be further improved until it is superior in all applications.

A number of European technical men were guests of the Akron Rubber Group at the meeting, including: J. B. Van Amerongen, Rubber Foundation, Delft, Holland; T. R. Schmauser ad S. Bostrom, Engelbert & Co., Aachen, Germany; and R. H. Windsor, R. H. Windsor Co., Ltd., London, England. L. A. Anderson, chairman of the membership committee, anouced that the Group now has 1,137 members. Group Chairman L. M. Baker, General Tire, announced the appointment of the following nominating committee to select a slate of officer cadidates for the following year: D. F. Behney, chairman, Harwick Standard Chemical Co.; E. L. Stangor, E. I. du Pont de Nemours & Co., Inc.; and C. A. Ritchie, B. F. Goodrich Co.

Groups' Informal Meetings

Ontario Golf Tournament

EXCELLENT weather featured the annual golf tournament of the Ontario Rubber Section, C.I.C., held September 6 at the Pine Point Golf Club, Toronto, Ont., Canada. Some 51 members and guests competed at golf; while 70 attended the dinner concluding the day. The trophy for top honors in the tournament was won by Jack Hammond, Gutta Percha & Rubber, Ltd.; while Stewart Murray, Charles Tennant Co., and Carl Croakman, Binney & Smith Co., tied for second prize. Herb Schmalz, Dominion Rubber Co., Ltd., was chairman of the arrangements committee and was assisted by Mr. Croakman; Lloyd Lomas, St. Lawrence Chemical Co.; and W. J. Nichol, Gutta Percha & Rubber.

Barbecues for Northern Calif.

THE annual summer outing and picnic of the Northern California Rubber Group was held August 10 at the Old Hearst Ranch. Dick Clausen, Pioneer Rubber Mills, was chairman of the committee in charge, which included Bob Gray, John and Stan Mason, Herb Wiley, and George Whitney, all of Pioneer. The program included golf, horseback riding, and swimming, and ended with a barbecue dinner and the distribution of contest prizes.

On September 26 the Burke Rubber Co., San Jose, was host to the Group at its annual Beer BQ, held as usual at Wieland's Gardens. About 70 members and guests enjoyed a delicious dinner, lots of beer, and an evening of entertainment. The program was planned and carried out by Messrs. Rockey, Halsey, and Burke.

Quebec Group Holds Dinner

THE Quebec Rubber & Plastics Group held its annual stag dinner and party on September 26 at the Queen's Hotel, Montreal, P.Q., Canada. Approximately 80 members and guests attended the dinner, while an additional 20 came for the evening of entertainment which followed. The entertainment included songs by a quartette and various members and a showing of movies taken at the Group's golf tournament in June.

Konkle Discusses Silastic

THE Los Angeles Rubber Group, Inc., held its October 7 meeting at its new headquarters, Hotel Statler, Los Angeles, Calif. More than 125 members and guests attended the afternoon technical session; while more than 400 were present at the evening dinner. The technical session featured a talk on "Recent Developments in Silastic" by George M. Konkle, Dow Corning Corp.

Mr. Konkle stated that Silastic has undergone a number of improvements since its introduction to industry in 1945, including increased low-temperature flexibility made possible by a change in the polymer; improved compression set through the use of mercury-containing additives; increased elongation and tear resistance; improved electrical properties; and reduced water absorption. Recent developments include low-set characteristics without the use of mercury additives, and coating pastes of increased toughness and temperature stability.

Heretofore it was not possible to combine all of these improvements in a single compound, Mr. Konkle said, but the latest development in Silastic comes close to reaching this ideal. This development consists of two new stocks, Silastic 50 and Silastic 60. These materials have the Shore hardness indicated by their numbers and can be blended to give compounds of intermediate hardness. They have a combination of desirable properties such as good tensile strength and elongation, low compression set, excellent electrical properties, and low water absorption. In addition, they contain no toxic materials such as mercury and are furnished in a neutral color which can be pigmented to any color.

A cocktail hour and dinner followed the technical session. After-dinner speaker was Carleton C. Rodee, University of Southern California, whose subject was "What We Don't Know Is Likely to Hurt Us." Dr. Rodee's talk dealt with the need of citizens to take a more active interest in their government. An entertainment program of vaudeville acts followed, and the meeting concluded with a drawing for door prizes. Prize winners were: J. H. Poole, Ohio Rubber Co.; Lloyd Reich, Triangle Tool & Machine Works, Fred Olster, Western Backing & Coating Co.; Francis Eriksen, Plastic & Rubber Products Co.; J. L. Ryan and Fred Owen, both of Goodyear Tire & Rubber Co.; John Arensmeyer, Golden West Rubber Products, Inc.; A. L. Pickard, Braun Corp.; and Harry Creighton, United States Rubber Co.

Tlargi Golf Tournament

The Los Angeles Group held its first fall golf tournament on September 26 at Inglewood Country Club, Inglewood, with some 45 members and guests participating in the event.

Prizes for winning golfers were distributed at the dinner which followed the tournament and were won by the following: blind bogey, Randy White, Arrowhead Rubber Co.; low net, Al Federico, C. P. Hall Co.; low gross, Miles Reinke, Reinke & Amende; closest to pin, C. Froude, Arrowhead Rubber; least putts, Wilbur Johnson, E. I. du Pont de Nemours & Co., Inc.; longest putt, Paul Karres, Rubber Teck, Inc.; blind hole, J. Locke, American Mineral Spirits Co.; and longest drive, R. Hill, Para Plate & Plastics Co.

Using Hypalon Properties

A TALK on "Utilizing the Properties of Hypalon S-2," by Malcolm A. Smook, E. I. du Pont de Nemours & Co., Inc., highlighted the October 16 meeting, the first of the current season and the annual business meeting, of the Elastomer & Plastics Group, Northeastern Section, American Chemical Society. The meeting was held at MIT, Cambridge, Mass., with 53 members and guests attending.

Dr. Smook described the method used in the manufacture of Hypalon S-2 chlorosulfonated polyethylene and stated that it is recommended for use with strong acids or in the presence of heat and ozone, or as a coating on other elastomers. Blending Hypalon S-2 with other elastomers gives superior compounds of economical cost which derive increased stability from the properties of the elastomers used in the mixture. For example, natural rubber added to Hypalon improves processing, tack, low-temperature flexibility, and electrical properties, and also reduces permanent set and hardness. Similarly, Hypalon added to natural rubber improves resistance to oxygen and ozone, increases modulus and abrasion resistance, and decreases permanent set.

Although compatibility is the main requirement for use of the new elastomer in blends, no difficulties arise in the curing stage because the two curing systems are so different that they do not compete for curatives, Dr. Smook stated. The use of Hycar OR-15 as a blending plasticizer for Hypalon was also discussed at some length by the speaker. Using charts to illustrate the effect of nitrile rubber content on ozone resistance, he pointed out that maximum ozone resistance was obtained with a blend containing 25% nitrile rubber and 75% Hypalon S-2.

Present applications of Hypalon S-2 include non-discoloring, lead molded, unsupported water hose jackets and garden hose; heat-resistant steam hose jackets; acid hose tube stock; decorative and protective coatings; matting design colors sprayed over flake aluminum barrier coats; non-contaminating food belts; colored proofings for camera bellows; food and refrigerator closure gaskets; deicers for airplanes and ships; and low-voltage, colored insulation stocks for wires and automotive goods. Other suggested applications include aeronautical parts; engine spark-plug covers; tire treads and sidewalls; and both open- and closed-cell sponge. No Hypalon latices are available as yet, Dr. Smook said. Many samples of applications were shown by the speaker, before the active discussion period.

Retiring Chairman R. A. Van Patten-Steiger, Alfred Hale Rubber Co., presided over the business session, which preceded the talk. A report was heard from the Group's secretary-treasurer, J. M. Hussey, Goodyear Tire & Rubber Co., who reviewed activities of the past year and noted that the Group now has a membership of 84. A slate of officer condidates for the coming year was presented by a nominating committee consisting of P. A. Coffin, General Latex & Chemical Co., J. H. Faull, consultant, and C. S. Frary, Jr., Boston Woven Hose & Rubber Co. The following officers were elected unanimously: chairman, L. H. Perry, Union Bay State Chemical Co.; vice chairman, Mr. Hussey; secretary-treasurer, F. J. Roderick, Simplex Wire & Cable Co.; executive committee member for two years, E. R. Caswell, Fabric Research Corp.; and custodian, W. J. Perkins, Avon Sole Co.

Hydrogenation of Polymers

A TALK on "Hydrogenation of Synthetic Elastomers" by R. Vernon Jones, Phillips Petroleum Co., featured the September 25 dinner-meeting of the Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind. Some 100 members and guests heard the talk which was based on a paper by Dr. Jones, C. Wayne Moberly, and W. B. Reynolds.

Dr. Jones stated that the hydrogenation of synthetic elastomers such as polybutadiene and copolymers of butadiene with various vinyl compounds produces a group of thermoplastic resins with interesting properties. These resins resemble polyethylene, but are generally more flexible, particularly at very low temperatures. For example, hydrogenated polybutadiene can be struck sharply at —100° F. without shattering, and is not brittle, although extremely hard, at liquid nitrogen temperatures.

Hydrogenation can be carried to various stages, depending on the properties desired. For most plastic applications, an unsaturation of 5-30% of the original amount is desirable. Higher unsaturations increase the ability of the products to undergo vulcanization. Some of the more important potential applications for hydrogenated polymers are in wire and cable coating, films, tubing, and various molded items. The trade mark Hydropol is used by Phillips for various hydrogenated high polymers now in the development stage in a program supported in part by the Office of the Quartermaster General.

In a meeting of the Group's executive committee, Jack Carlson, Paranite Wire & Cable Co., was chosen secretary-treasurer to fill the unexpired term of Elmer Ranga who left the Fort Wayne area to accept a position with J. M. Huber Co. at Borger, Tex. The following committee chairmen were also appointed: nominating, M. Jones, Marbon Corp.; outing, W. J. Johnson, Goshen Rubber Co.; program, D. Sherman, United States Rubber Co.; publicity, P. J. Giordan, U. S. Rubber; tickets, J. Dunne, C. P. Hall Chemical Co; and membership, A. L. Robinson, Harwick Standard Chemical Co.

Washington Group Elects

THE Washington Rubbber Group held its annual banquet and installation of officers on October 21 at the Touchdown Club, Washington, D. C. Approximately 100 member, guests, and their wives attended the affair, which included a cocktail hour, dinner, and an evening of dancing. Harold Wirth, Firestone Tire & Rubber Co., acted as toastmaster at the dinner, and brief addresses were made by the retiring president, Ted Scanlan, Gates Rubber Co., and the incoming president, Norman Bekkedahl, National Bureau of Standards.

Dr. Bekkedahl introduced the other new officers of the Group, as follows: vice president, George Riviere, Goodyear Tire & Rubber Co.; secretary, William J. McCarthy, Office of Synthetic Rubber, RFC; treasurer, Juan Montermoso, Rubber Section, Army Quartermaster General; and recording secretary, Miss Ethel Levene, Navy Bureau of Ships. Committee chairmen for the coming year are: membership, T. A. Werkenthin, Bureau of Ships; program, John T. Cox, Jr.,

(*Continued on page 284*)

NEWS of the MONTH

The rubber industry's recommendations for turning over the government's synthetic rubber plants to private industry, made by the disposal subcommittee of the RFC's Rubber Industry Advisory Committee on August 19, have finally become available to India RUBBER WORLD. The industry po.nted out that in disposal of the plants if the government were to emphasize price above everything, it might limit to a considerable degree the number and the size of prospective purchasers. Mandatory consumption of synthetic rubber was not considered necessary beyond 1954.

Details of the means by which the synthetic plants will be appraised and a schedule of the plants to be appraised have been made public. The Reconstruction Finance Corp. selected, on October 27, Ralph M. Parsons Co., Los Angeles, Calif., low bidder for the appraisal job, to make the engineering appraisal of the 23 facilities involved.

RFC is opening the Kobuta, Pa., alcohol butadiene plant again because of an increase in GR-S demand beyond the available petroleum butadiene supplies, also to use up 24 million gallons of alcohol left when the alcohol butadiene plants were all shut down September 1.

A controversy between tire manufacturers and the Office of Price Stabilization on the proper ceiling price for second-line low-pressure tires should be decided by mid-November.

"Natural Rubber News" has provided estimates of probable natural rubber consumption for 1952-1956 based on The Goodyear Tire & Rubber Co.'s chart on the areas of natural and GR-S competition, as of July 1, 1952.

Leading rubber industry executives made statements on government policy and business during October.

The Wage Stabilization Board approved the 10¢-an-hour wage increase for United Rubber Workers, CIO, negotiated last August and gave a more or less blanket approval for such increases if companies had been following the "Big Four" increase pattern.

Washington Report by Arthur J. Kraft

Industry Plans for Synthetic Plant Disposal Submitted; Plant Appraisal Scheduled

The rubber goods manufacturing industry's first full-dress recommendations of a program for turning over the government's synthetic rubber facilities to private industry were submitted to the Reconstruction Finance Corp., under the date of August 19. Titled a "Plan for the Disposal of the Government-Owned Rubber Producing Facilities to Private Industry," the 14-page document was submitted by the disposal subcommittee of the RFC's Rubber Industry Advisory Committee. In presenting the report to Morton E. Yohalem, Special Deputy of RFC for Rubber Facilities Disposal, the subcommittee said it "represents the careful and unanimous thinking of a wide cross-section of the rubber manufacturing industry as to size, location and product classification."

The plan was worked out in accordance with suggestions made by Mr. Yohalem, the subcommittee noted, in his get-acquainted meetings with the subcommittee on June 9 and 10. Your reporter has acquired a copy of the subcommittee report, and liberal quotations are given below.

While RFC officials are withholding detailed comment on the progress of disposal planning, they make no secret of their opinion that the industry suggestions made in the August 19 report are not the last word in what they are looking for. It seems extremely doubtful that RFC will go along with the industry's philosophy of playing down the importance of the prices at which the plants should be sold and the terms of payment suggested in the industry report. Other agencies may not go along with the industry suggestions that the majority of the plants, in the first round of disposal, go to rubber consuming firms, and that any plants sold subsequently go only to rubber consuming firms.

The report was submitted by the following persons making up the RFC Industry Advisory subcommittee: C. H. Baker, president, Kentucky Synthetic Corp.; C. F. Burke, assistant to the president, General Tire & Rubber Co.; F. D. Hendrickson, president, American Hard Rubber Co.; Everett Morss, president, Simplex Wire & Cable Co.; Arthur Nellen, vice president, Copolymer Corp.; B., J. Oakes, Midland Rubber Corp.; W. S. Richardson, vice president, B. F. Goodrich Co.; J. C. Roberts, Firestone Tire & Rubber Co.; G. M. Tisdale, vice president, United States Rubber Co.; Thomas Robins, Jr., president, Hewitt-Robins, Inc.; and R. S. Wilson, Goodyear Tire & Rubber Co.

Mr. Yohalem has been delegated by the RFC Administrator to prepare a report on disposal for consideration by the President by March 1, 1953. The President is required, under Congressional directive, to submit his recommendations to Congress by April 15. Mr. Yohalem, while seeking industry advice on suggested "ground rules" for disposing of the facilities, is developing some ideas of his own. So, while the report submitted by the industry is not the final work, it provides an idea of industry thinking as of the present time. The impression that this reporter has picked up is that there is considerable disparity between industry ideas, as embodied in the August 19 report, and government thinking on disposal. Unless one group or the other concedes a bit more, it will be extremely difficult to prepare a cohesive set of disposal recommendations to which all parties—industry (and not just the rubber industry), RFC, other government agencies such as the Defense Department and the Justice Department's anti-trust division, and Congress—may agree. The plan advanced by the RFC industry advisors in the present instance does not vary greatly from the more roughly sketched "plans" advanced by individual firms in Congressional hearings back in 1948. Congress was hostile to those plans at the time they were made. The all-important question may be whether Congress and the President agree that conditions have changed sufficiently since then to warrant going along with disposal at all.

Appended to the industry report is a chart prepared by the General Services Administration projecting to 1960 its ideas on world new rubber supply and demand. These projections indicate that synthetic rubber facilities may have to be increased between 40 and 150% by 1960, based on varying levels of available supply of new rubber and the maximum and minimum ranges of synthetic rubber consumption.

Extracts from the subcommittee report follow:

"OBJECTIVES

"A plan to be practical and acceptable to both Government and industry should have the following objectives:

"1 The protection of National Security.

"2. The establishment of a free and competitive industry.

"3. The adequate protection of small industry.

"4. The protection of the national investment in the rubber producing facilities.

"5. Conformity with Congressional mandates as expressed in the recent concensus of the two Houses of Congress expressed in the statement of Senator Lyndon B. Johnson, as follows:

" 'It was the concensus of the conferees that Congress must be satisfied that there is no longer any necessity for any Government controls with respect to production and consumption of synthetic rubber prior to the disposal of these facilities. The disposal program should envision a clean-cut separation of the Government from the rubber industry.' And this quotation from the House conferees: 'Once the Government is out of the rubber business there should be no longer any required consumption or guaranteed market.'

"Let us discuss these objectives one by one.

"NATIONAL SECURITY

"Probably the first requisite for national security with respect to synthetic rubbber facilities is that any prospective purchaser agree to maintain the present government copolymer, butyl, butadiene and styrene facilities in either active or adequate stand-by condition for a period of 10 years, or so long as the Government has an unsatisfied mortgage obligation against the facility but in no case for less than five years.

"Heretofore in consideration of this problem it has always been felt that

the President should be given power to compel the use of certain quantities of synthetic rubber within the United States. The statistical world supply-demand picture makes it apparent that such mandatory use powers are no longer necessary . . . . there is no period from 1954 forward where the manufacture of less than 700,000 long tons of synthetic rubber is required to equalize supply with demand. In such a situation there is no danger that the know-how of synthetic rubber production will be jeopardized.

"Furthermore, if at this time as a result of negotiations, private industry is willing to buy substantial synthetic rubber producing facilities and the requisite butadiene facilities, it will be quite apparent that private industry has faith in the future of the synthetic rubber industry without any aid in the form of mandatory use or guaranteed market.

"Nevertheless it is recommended that purchasers of copolymer plants be required to agree to produce and either use or sell their proportionate share of 200,000 long tons of GR-S per year and 21,000 long tons per year of rubber suitable for inner tubes for a period of five years.

"The Establishment of a Free and Competitive Industry

"The advantages of private ownership of the synthetic rubber producing facilities are adequately outlined in the President's report transmitted to Congress in January, 1950.

"The purchasers of copolymer, butyl, butadiene and styrene plants will be, of necessity, companies of fairly substantial size because of the investment involved. These companies, however, by the very nature of American industry and by reason of the adequate safeguards provided by law, will be highly competitive, eager to sell any amount of their product to users of either large or small quantities of synthetic rubbers.

"Recognizing the desirability of assuring GR-S availability to non-producer users, it is recommended that each purchaser of copolymer facilities contract to offer for sale at current market prices, 10% of his going rate of monthly production up to a maximum of 10% of the monthly capacity required.

"The Protection of the National Investment in the Rubber Producing Facilities

"Large amounts of public funds were invested in the Government-owned rubber producing facilities. In the conduct of the Government-owned synthetic rubber industry, good business practices have been observed, and adequate depreciation has been charged into the selling price of the synthetic rubber. Beyond this, the facilities have turned in a substantial profit. Thus a large portion of the public funds invested in the rubber producing facilities has already been returned to the public treasury. The rubber producing facilities should not be sold to private industry for anything less than the book value of the facilities at the time of disposal, unless justified by circumstances such as obsolescence, high cost, location or other considerations.

"However, it would not be to the best interests of the country, if the Government were to take advantage of its monopolistic position to try to obtain an uneconomically high price for the facilities.

"Price

"Many factors are involved in the purchase of either copolymer, butyl, butadiene, or styrene plants. For instance, before a prospective buyer can safely purchase a copolymer plant he must make arrangements for an assured source of supply of butadiene and styrene. Before a prospective buyer of a butadiene plant can safely purchase, he must make arrangements for an assured source of supply of feed stocks. The price at which a prospective buyer of either a copolymer or butadiene plant can purchase depends to a certain extent on the degree of obsolescence of the plant on which he is bidding and on its location with respect to availability of feed stocks and proximity to markets for finished product. Since national security is a prime essential, it is important that the majority of the plants be sold to those who have the greatest interest in the rapid technological improvement of synthetic rubber, namely the consumers of rubber.

"The Government should obtain a fair and equitable price for the facilities, but once such a price is assured, there are other considerations that are even more important in carrying out the long-adherred-to policy . . . . 'that there shall be maintained at all times in the interest of national security and common defense a technologically advanced and rapidly expandable rubber producing industry in the United States.' Great strides in improvement of polymers and end-products lie ahead if the plants are sold to those best able and most interested to develop them further.

"If the Government were to emphasize price above everything, it might limit to an unwise degree the number and size of prospective purchasers.

"For these reasons it is deemed unrealistic for Government to attempt to sell these plants on a sealed bid basis. They should be sold on a negotiated basis as described in the next subhead.

"Negotiations

"The Government should nominate a date for submission of requests to negotiate for certain plants, nominating certain minimum requirements as to price credit responsibility, operating and technological know-how, etc., and setting a date after which no further requests for negotiation would be received.

"The Government should then enter into negotiations with each prospective purchaser. In these negotiations the Government agency should give consideration to such all-important things as proven ability adequate technical staff, present consumption requirements, and the general reputation of the prospective purchaser, together with price offered by the prospective purchaser in the course of the negotiation.

"After negotiations have proceeded far enough, Government should announce whether it has sufficient active prospective purchasers to assure the sale of an adequate percentage of the Government-owned rubber producing facilities. This for the reason that Congress has made it clear they do not want to sell any of the plants unless a sufficient number of plants can be sold to enable Government to get completely out of the production of synthetic rubber.

"It is desirable that as nearly as practicable all purchasers acquire plants simultaneously, so they will get an even start with the operation, and so that there need be no period of concurrent private and Government operation. Actual transfer of any plants should be held in abeyance until the end of the negotiations, and a date should be set for the transfer of all plants to their new owners.

"After the plants have been transferred to their new owners, the Government shall cease to operate any rubber producing facilities.

"Any plants not sold in the first disposal shall be placed in stand-by by the Government and held for later sale.

"Negotiations to purchase plants at a later date will require a reestimate of fair value. Late buyers of facilities should not be permitted to buy at prices more favorable than the prices paid by purchasers who participate in the initial disposal program.

"Terms

"Having negotiated the purchase price, the purchaser will enter into a purchase agreement of the following type:

"(a) *Down Payment.* The purchaser will agree to make a down payment of 10% on or before the date of the actual transfer of the plant to the purchaser. The balance of the purchase price will be secured with a 10-year first mortgage bearing interest at a reasonable rate computed annually on the remaining principal balance.

"(b) The remaining principal balance will be liquidated through the payment of a set amount for each ton of synthetic rubber produced. This will be computed as follows:

"1. Deduct from the purchase price the 10% down payment as provided in (a).

"2. As principal payments will extend over a 10-year period, divide the remainder of the purchase price by 10, arriving at the 'expected annual payment.'

"Each year the purchaser will pay the government an agreed-upon 'through-put' rate for each ton of production, which payment shall be an amount not more than the 'expected annual payment' or less than 50% thereof and which shall be in full discharge and satisfaction of the 'expected annual payment' for such year.

"(c) The Government will agee that, at the purchaser's option, interest and principal payments may be postponed during periods when the plant might be shut down. However, the aggregate postponement of payments will not exceed two years.

"(d) The purchaser will have the right at any interest date to discharge all or part of the mortgage obligation by the payment to the Government of one or more 'expected annual payments.'

"(e) The purchaser and the Government will agree that failure by the purchaser to maintain payments on the basis outlined herein, except for periods of plant shutdown as provided, will allow the Government to repossess the plant without further liability on the part of the purchaser.

"(f) In recognition of the age and potential obsolescence of the facility and of its defense characteristics and to compensate for the obligation assumed by the purchaser in fulfilling the security provision, the Disposal Act should provide that the purchaser be authorized to write accelerated amortization and that the Treasury Department accept such amortization for tax purposes.

"Under the above proposal the down payment [outlined in (a) above] plus the total payments [as outlined in (b) above] accumulated over the 10-year period, will complete the purchaser's obligation to the Government and thereupon he will receive clear title to the plant.

"If the plant is operated at less than full capacity, the purchaser will be obligated in the interest of national security to maintain at his own expense the unused portion of the plant in stand-by condition. Under the above proposal, during periods of low production the difference between the actual 'through-put' payments and the full 'expected annual payment' will be

considered as reimbursement to the purchaser for maintaining unused facilities in stand-by at no cost to the Government.

"Other Conditions of Sale

"Public Law 469 in its 'Declaration of Policy' stresses the necessity in the interests of national security of maintaining a technologically advanced and rapidly expansible rubber-producing industry in the United States.

"It is apparent that the best interests of national security are served by making sure that the rubber producing facilities unsold shall be sold into the hands of a purchaser with the following qualifications:

"1. Proven know-how for the operation of the plants.

"2. Adequate technological staffs with the background of long-time experience in the advancement of the technology of synthetic rubber.

"3. Capacity to consume product of the plants which in turn guarantees the maximum degree of interest in the improvement of the quality and lowering of the cost of synthetic rubber."

Synthetic Plant Appraisal

On September 29, Mr. Yohalem sent to members of the Agency's Rubber Industry Advisory Committee and the smaller group of Conferees on Plant Disposal a tentative set of specifications for appraising the value of the government's synthetic rubber facilities. Attached to this set of specifications, which was sent also to six engineering firms invited to submit bids to handle the appraisal job, were two schedules. Schedule A listed the 22 facilities to be appraised, omitting only three government owned synthetic rubber facilities, the two "mothballed" alcohol butadiene plants, whose future is yet to be considered by RFC, and the West Coast styrene plant. Ralph M. Parsons Co., one of the engineering firms asked to submit bids to appraise the 22 facilities, had appraised the styrene facility some years ago and will be asked to up-date its appraisal. In any event Mr. Yohalem makes clear in setting forth the specifications for the overall appraisal job that RFC hopes to turn the styrene facility over to private ownership.

The six engineering firms invited to submit bids were Blaw-Knox Construction Co.; Day & Zimmerman, Inc.; Ebasco Services, Inc.; The Fluor Corp., Ltd.; Ford, Bacon & Davis, Inc.; and Ralph M. Parsons Co. Others may have been included later. Bids were to be opened October 24, and an award made October 27. [The Ralph M. Parsons Co., was low bidder on October 27. Editor.] A report, setting a value on each of the 22 facilities listed in Schedule A, is to be submitted to RFC by January 30, 1953. The second schedule attached to the specifications is Schedule B, listing the "Process and Other Facility Areas" to be covered by the appraisal. Ten such "areas" are listed for each of the three chief types of facilities involved, that is, copolymer, butadiene, and butyl plants.

In outlining the scope of the appraisal report, the specifications instruct the appraiser—for the purpose of preparing his reports—to "proceed upon the following basis:

"A. While the appraiser is not expected to express an independent judgment as to the level of anticipated consumption of synthetic rubbers, it is expected that the analyses and reports will take cognizance of the possible disparities in valuation of the respective facilities resulting from operation at various percentages of plant capacity.

"B. The appraiser shall assume that the selling price of synthetic rubbers will be such as to cover all costs, plus a fair return on the capital which will be required to be invested in the synthetic rubber business.

"C. In appraising the value of the polymerization facilities, the appraiser shall assume that the butadiene facilities, and the styrene production facilities at Los

Facilities to Be Appraised

Schedule A to Appraisal Specifications

Butadiene

Operator	Plant Location	Approx. Production Capacity Short tons, per Year
Cities Service Refg. Co.	Lake Charles, La.	62,500 butadiene from butylenes
Copolymer Corp.	Baton Rouge, La.	23,000 butadiene from butylenes
Humble Oil & Refg. Co.	Baytown, Texas	51,500 butadiene from butylenes
Neches Butane Products Co.	Port Neches, Tex.	180,000 butadiene from butylenes
Sinclair Rubber, Inc.	Houston, Tex.	80,000 butadiene from butylenes
Phillips Chemical Co.	Borger, Tex.	76,000 butadiene from butane
Standard Calif. & Shell Chemical Corp.	Torrance, Calif.	58,000 butadiene from butane

Butyl

Esso Standard Oil Co.	Baton Rouge, La.	45,000 long tons
Humble Oil & Refg. Co.	Baytown, Tex.	45,000 long tons

Copolymer Plants

Operator	Plant Location	APC, Long Tons	Other Participating Companies and % of Participation	
Firestone Tire & Rubber Co.	Lake Charles, La.	98,000		None
	Akron, O.	30,000	10	—Carlisle Corp., Carlisle, Pa.
B. F. Goodrich Chemical Co.	Port Neches, Tex.	87,000		None
	Institute, W. Va.	122,000	10	—Denman Rubber Co., Warren, O.
Goodyear Synthetic Rubber Corp.	Houston, Tex.	100,000		None
	Akron, O.	18,000	35	—General Latex & Chemical Corp., Cambridge, Mass.
			10	—Mohawk Rubber Co., Akron, O.
United States Rubber Co.	Port Neches, Tex.	88,000		None
	Naugatuck, Conn.	25,000	10	—Cooper Tire & Rubber Co., Findlay, O.
General Tire & Rubber Co.	Baytown, Tex.	44,000	5	—McCreary Tire & Rubber Co., Indiana, Pa.
Phillips Chemical Co.,	Borger, Tex.	66,000		None
Midland Rubber Corp.	Torrance, Calif.	89,000	35	—Pacific Rubber Co., Oakland, Calif.
Copolymer Corp.*	Baton Rouge, La.	49,000	12.5	—Armstrong Rubber Co., West Haven, Conn.
			12.5	—Armstrong Rubber Mfg. Co., Des Moines, Iowa
			12.5	—Dayton Rubber Co., Dayton, O.
			12.5	—Gates Rubber Co., Denver, Colo.
			12.5	—Lee Rubber & Tire Corp., Conshohocken, Pa.
			12.5	—Mansfield Tire & Rubber Co., Mansfield, O.
			12.5	—Sears, Roebuck & Co. (including Armstrong Tire & Rubber Co., Natchez, Miss., in which Sears, Roebuck owns 50% of the voting stock)
			12.5	—Seiberling Rubber Co., Akron, O.
Kentucky Synthetic Rubber Corp.*	Louisville, Ky.	44,000	10	—American Hard Rubber Co., New York, N. Y.
			10	—Boston Woven Hose & Rubber Co., Boston, Mass.
			10	—Brown Rubber Co., Inc., Lafayette, Ind.
			10	—Hewitt-Robins, Inc., Stamford, Conn.
			10	—Goodall Rubber Products Co., Trenton, N. J.
			10	—Sponge Rubber Products Co., Shelton, Conn.
			10	—Sheller Mfg. Corp., Portland, Ind.
			10	—Simplex Wire & Cable Co., Cambridge, Mass.
			10	—Thiokol Corp., Trenton, N. J.
			10	—Raybestos-Manhattan, Inc., Passaic, N. J.

Total Tonnages to Be Appraised

Butadiene	531,000 short tons per year
Butyl	90,000 long tons per year
Copolymer	860,000 long tons per year

*Copolymer Corp. and Kentucky Synthetic Rubber Corp. are each separate corporations which are wholly owned by the companies listed as equal stockholders.

Schedule B

Process and Other Facility Areas

Butadiene Plants

1. Butane feed preparation (butane feed plants only)
2. Butane dehydrogenation (butane feed plants only)
3. Butylene feed preparation
4. Butylene dehydrogenation
5. Butadiene purification
6. Major utility facilities
   a. steam
   b. electrical
   c. other
7. Tank farm, pipe lines, and pumping stations
8. Administrative
9. Major service units
10. Miscellaneous

Butyl Plants

1. Isoprene extraction (Esso only)
2. Isobutylene extraction
3. Polymerization
4. Finishing
5. Butyl warehouse
6. Major utility facilities
   a. steam
   b. electrical
   c. other
7. Tank farm, pipe lines, and pumping station
8. Administrative
9. Major service units
10. Miscellaneous

Copolymer Plants

1. Pigment preparation and warehouse
2. Polymerization
3. Recovery
4. Finishing, including all latex storage facilities
5. Rubber warehouses
6. Major utility facilities
   a. steam
   b. electrical
   c. other
7. Tank farm, pipe lines, and pumping station
8. Administrative
9. Major service units
10. Miscellaneous

Angeles, will have been placed under private ownership and operation, and that there will be a commercial supply of the component materials necessary for the manufacture of synthetic rubber.

"D. In appraising the butadiene facilities, the appraiser's conclusions shall be based upon his analysis of the supplies of butane or butylene, as the case may be, which are, or which may, in his opinion, become available to the respective facilities. While independently considering the prospective markets for butadiene for purposes other than rubber manufacture, the appraiser shall assume that, in any event, polymerization facilities, with consumption requirements fairly comparable to the capacity of the butadiene facilities under appraisal, will be in operation; i.e., that there will be a market for the end-product. Effect shall be given to the considerations discussed in paragraph A above.

"E. The appraisals of the respective facilities shall be made without regard to the identity of the present operators or the terms of the present operating agreements."

The section of the specifications setting forth the Method of Appraisal completes the heart of the five-page, single-space text of the specifications and gives a fairly comprehensive idea of how RFC is approaching the disposal question. This section follows in its entirety:

"The general approach to the appraisal will be based on the determination of the reproduction cost of a modern plant of equivalent capacity adjusted for the depreciation in the existing plants including scientific obsolescence, and adjusted for such economic factors as result from the location of the plant." [In other words, the appraiser will figure the cost of building today a sort of "model" plant incorporating the most up-to-date features found in the existing network of rubber plants This will be done for a copolymer, a petroleum butadiene, and a butyl plant. From the figures developed for these "prototypes" the appraiser will make adjustments for varying conditions, obsolescence, and economic factors, in coming up with a figure for each of the existing 22 plants. Besides location, economic factors might include the type of rubber made in each plant.]

"The reproduction cost of a modern plant of equivalent capacity will be estimated in accordance with sound engineering and valuation practice. It is anticipated that this cost may be determined for one of each existing type of plant (copolymer, butadiene and butyl) by sufficiently detailing reproduction cost and adjusting such cost for scientific obsolescence, including changes in the process, design modifications and present-day construction practice. However, a detailed quantity survey or take-off would not be expected. The cost of a modern facility would include all items of expense to which a typical well-informed prospective owner would be subject if he were to undertake as of the date of appraisal to reproduce the existing capacity in new condition. The estimate should be based on the cost of labor, materials, equipment, freight, handling and such overhead costs as are normally incurred in the design and construction of the type of plant in question by a general contractor under usual construction conditions during regular working hours prevailing in the locality at the time of the report. To these direct costs should be added an allowance to cover general overhead costs, such as engineering and supervision, interest, taxes and insurance during the period of construction and installation, wherever such costs normally would be incurred. No allowance should be made in the estimate for the cost of financing, or for a completion bond. It should be assumed that suitable material in proper quantities would be available and that engineering work would be completed sufficiently in advance of construction to permit orderly planning of the work and obtaining of competitive construction bids. It is not anticipated that detailed reproduction cost estimates will be separately made for each facility of similar type, except to the extent required by significant design or construction variation.

"The depreciation in the existing plants will be established by determining the physical deterioration and obsolescence of each plant. This physical deterioration will be established from actual observation in the field and from the plant records of the physical condition (inspection reports, etc.) and cost of maintenance, to determine remaining serviceable life of the plant and equipment for continued use of each specific plant in its present purpose. Scientific obsolescence will include all factors resulting from modernization of the process, equipment, know-how and construction practice. In determining such obsolescence, if any, consideration will be given to the efficiency and cost of operation at each individual facility as compared with the modern plant. The appraisal will also reflect the consideration given to the effect of the size and rated capacity of the facilities, and to the effect on costs resulting from operation at various levels of capacity at each plant. For this latter purpose, operation should be assumed at capacity, and at 90, 80, 70, and 60 per cent thereof. In addition to the foregoing, adequate consideration should be given to those items affecting costs which result from the location of the plant, such as taxes, transportation, availability and cost of raw material, labor, utilities and fuel.

"Those elements of the facilities which are no longer in use in the process and can be physically moved or separated without affecting the process, should be separately valued for sale, assuming that the equipment would be dismantled and disposed of in the current market."

The appraisal report will include a separate report for each facility and a summary report comparing all the facilities by types. The appraisal is to have a section including "an estimate of the off-plant overhead, and other costs that would be incurred if the facility were purchased by a private firm and operated as an independent entity. This should, of course, include all selling and executive management expense."

Alcohol Butadiene in Production Again; GR-S Production Increased

The RFC in late October ordered the partial reactivation of its Kobuta, Pa., alcohol butadiene plant, as the agency found increasing demand for GR-S and a shortage of butylene combining in a squeeze on its supplies of petroleum butadiene.

The order, reopening two lines at Kobuta, reverses, apparently for at least six months, the September 1 order of RFC closing down the Kobuta facility. RFC officials noted that butylenes are in tight supply partly because of heavy demand for the military high-octane aviation gasoline program. The Armed Services have been finding it extremely difficult to cover their current requirements for such aviation gasoline, and the petroleum refining industry has been subject to numerous pleas from government to boost output.

Concurrent with the decision to reopen Kobuta, one of the two alcohol butadiene facilities owned by RFC and ordered back into "mothballs" by RFC in the past few months, the agency also decided to withdraw its petroleum butadiene from the commercial market. It was put on the market September 1 at 18¢ a pound, when slackening demand and top-heavy inventories of GR-S found RFC with excess petroleum butadiene production. The date for withdrawing petroleum butadiene from the commercial market was not definitely set at this writing [October 24]. There were reports that RFC was attempting to put off the cut-off date to December 1.

As noted elsewhere in this report, RFC sales of GR-S in September substantially exceeded production. The same situation is apparently continuing through October, with order books totaling some 51,000 tons late in the month, against a production schedule of 48,000, which may fall short of attainment, thus jeopardizing the balanced inventory position.

The reopening of the Kobuta plant will enable RFC to work off some 24 million gallons of alcohol it was left holding when the alcohol butadiene plants were ordered closed in September. The alcohol was bought when the market was high. Its use raises the cost of butadiene to 39¢ a pound, more than double RFC's cost of producing petroleum butadiene.

RFC officials insist that the shortage of petroleum butadiene to feed increasing GR-S requirements is the reason for reopening the alcohol butadiene plant, although they admit that right up to the time the decision to reopen was made, the agency was attempting to sell at least some, if not all, of its excess alcohol to Army Ordnance. Negotiations with the Army fell through when Ordnance refused to pay more than the current market price for alcohol. RFC would have lost at least $5 million if it let the alcohol go to the Army at current market prices. Ordnance will be able to meet its alcohol needs from the commercial market. There is no reason to believe, had RFC sold its high-priced alcohol to Ordnance, that RFC could not have done the same.

The two lines being reopened at Kobuta will be able to produce 4,400 tons a month of alcohol butadiene (2,200 to a line). It would run through 24 million gallons of alcohol in about six months' time. While RFC officials have not plans at this time to seek additional alcohol supplies, they are reported meeting some objections from Koppers Co., operator of the Kobuta facility, to reopening for only six months. Koppers, it was reported, was seeking assurance that the plant will be kept operating for a longer period.

The return of high-priced butadiene to an active part in GR-S production is not expected to result in any change in RFC's selling price for GR-S. The

current selling price of 23¢ a pound was designed to reflect a substantial amount of alcohol based butadiene as well as the cheaper petroleum butadiene, and RFC has been rolling in handsome profits on its GR-S sales.

RFC Production Up, Price Steady

RFC Synthetic Rubber Director E. Dorrance Kelly said in October that the Government is "not considering any change in the price of GR-S in the "foreseeable future," and he defined the "foreseeable future" to read "as far as we can see ahead." Mr. Kelly made this statement in answer to rumors circulating in the New York rubber trade that a price reduction was imminent. Such rumors, he noted, have cropped up at least twice a month over the past six months.

Productionwise, the agency scheduled GR-S output at 48,340 long tons for October, including 21,250 tons of LTP GR-S. September sales, amounting to 54,334.3 long tons, far exceeded the scheduled September production of 43,500 tons. August sales had exceeded that month's scheduled output of 47,000 tons by little more than 2,000 tons.

September sales included 28,733.8 tons of LTP GR-S, 10,223.2 tons of black masterbatch, 5,069.9 tons of oil masterbatch, 1,574.2 tons of oil-black masterbatch, and 3,265.5 tons of GR-S latex. Butyl rubber sales totaled 5,582.5 tons. While LTP GR-S, latex and butyl sales figures approximated scheduled output of these rubbers in September, sales of the three masterbatch types, in each case, doubled the month's output. This was by design, since September production schedules for the masterbatch rubbers were dropped sharply from August levels to help move heavy inventories of these types.

October production schedules call for restoring output of the masterbatch rubbers to high levels, with black masterbatch set for 12,101 tons, oil masterbatch for 5,081 tons, and oil black masterbatch for 1,116 tons. In addition, RFC has scheduled GR-S latex output for 3,499 tons, and butyl for 5,500 tons. [All figures for the three masterbatch types refer to gross weight of the material. The figures for the other types refer to net weight.]

The Second-Line Tire Price Controversy

OPS and the tire manufacturing industry have been involved for some months in a controversy over methods of pricing second-line low-pressure tires for the replacement trade. By mid-November, the OPS is expected to make known its decision whether to concede the argument to the industry or to seek a Justice Department complaint charging five of the tire firms with violations of price ceiling regulations — that is, overcharging for second-line low-pressure tires.

The controversy strikes into the industry's customary tire pricing practices so deeply that the entire industry is aroused, although only a fraction of the companies making these tires are involved directly in a possible violation case. The Rubber Manufacturers Association, Inc., tire executive committee last month adopted a unanimous resolution condemning the OPS position as contrary to traditional industry pricing practices. The resolution will be presented to Washington, should OPS enforcement officials press a ceiling price violation claim.

The five firms currently involved in possible ceiling price violations are Goodyear Tire & Rubber Co., its wholly owned subsidiary, Kelly-Springfield Tire Co., Firestone Tire & Rubber Co., Armstrong Rubber Co., and Mohawk Rubber Co. Not a great deal of money is involved, with the most frequently reported estimate at $250,000 if OPS seeks treble damages.

In brief summary, the controversy evolved as follows:

When NPA Order M-2 restrictions on the manufacture of a second-line tire were removed at the start of this year, a number of companies resumed production of second-line tires, marketing, for the first time, a second-line low-pressure tire. Since this tire was not produced during the base period of the applicable OPS price regulation—the General Ceiling Price Regulation, the companies were required to establish ceiling prices in accordance with the "new goods" provisions of the GCPR. These required the industry to derive its ceiling from a comparison with the ceiling for the most nearly comparable commodity in an existing category. The companies took as their comparison commodity their first-line low-pressure replacement tire.

The second-line low-pressure tires went on the market in January and February of this year. The manufacturers, about the same time, informed OPS pricing officials that they had used their first-line LP as the comparison commodity because the industry considers low-pressure tires as a category. Conventional, standard-pressure tires, they said, are considered as a separate category of tires. The OPS pricing officials—the director of the Rubber Branch—gave informal approval to this practice in a letter to the companies in May.

The controversy arose when another part of the OPS, the enforcement division, questioned the propriety of considering as separate categories low-pressure tires and conventional tires. It asked an interpretation of the OPS legal division. OPS lawyers issued two interpretations to the GCPR in late August (Interpretations 56 and 57). These held that there is only one category of tires, and that the industry should consider the most nearly like tire to the second-line LP its second-line conventional tire, or, lacking that, the lower-cost type of tire which the second-line LP replaces as a trade item.

The interpretations instructed the industry, for instance, to compare its second-line LP 6.70 x 15 tire with the second-line 6.00 x 16, reasoning that the first-line 6.70 x 15 has replaced the first line 6.00 x 16 as original equipment of smaller cars, such as the Ford, Plymouth, and Chevrolet.

The OPS price policy officials then reentered the controversy by issuing early in September, Supplementary Regulation 118 to the GCPR, fixing ceiling prices for second-line LP's at 75% of the existing ceilings for the first-line LP's. Since the manufacturers generally voluntarily sold their second-line LPs below the ceilings they had calculated for themselves back in January and February, the effect of this regulation was to cut prices for second-line LPs only about 2-3%. However, the real significance of SR 118 is that it apparently confirms the industry's basic contention that first-line LPs are the proper comparison commodity for establishing ceilings for second-line LPs, and that LPs are a category. SR 118, therefore, pretty clearly contradicts the two interpretations issued by the OPS lawyers only a few weeks earlier.

he immediate effect of SR 118, it is reported, was to free from possible ceiling price violations several of the tire firms which, because of their particular cost-price relations, were selling second-line LPs at prices below the ceilings that might apply had they used the methods prescribed by the legal interpretations. OPS cannot charge a ceiling price violation simply because the wrong method was used to calculate the price. It must find that the price which the manufacturer got for his tire exceeded ceiling prices. The issuance of SR 118 narrowed the controversy to the prices charged by five companies (the list may be cut down as a result of a cost-data questionnaire recently sent to all second-line tire makers by OPS enforcement officers) from the time they placed their second-line LPs on the market early this year to September 10, when SR 118 took effect.

While applicable ceilings vary, depending on the individual manufacturer's costs, here is a comparison of retail list prices for second-line LPs for the major companies: Under SR 18, the 6.70 x 15 is $16.55, or 4¢ below the price charged before the order took effect. For the 7.10 x 15, the SR-118 ceiling is $18.35, or 60¢ lower than before; for the 7.60 x 15, the SR-118 ceiling is $20.05, or 90¢ lower.

As for the prices in controversy, the $16.95 price which the major manufacturers had sold their second-line 6.70 x 15 LP tire begore SR 118 was issued is well below the ceiling price they had calculated by using the first-line LP of the same size as the comparison commodity. Using that method, they could have put a price tag of from $17.50 to $18.50 on the 6.70 x 15 LP tire. By using the method set forth in the legal interpretations issued in August, that is, using the second-line conventional 6.00 x 16 tire as the comparison commodity, their ceiling price might have ranged from as low as $14.85 to about $18, varying with the manufacturer.

If the controversy results in a compliance complaint, it will have the manufacturers contending that they were within the law in charging $16.95 for the second-line 6.70 x 15 LP tire from the time of its introduction until September 10, when the SR-118 price took effect, and OPS enforcement officials contending that during that period manufacturers were entitled to no more than $14.85.

FTC Tire Discount Rule and Other Reports

Federal District Judge McGuire is slated to hand down a ruling on company and government motions before the U. S. District Court in the District of Columbia relating to the Federal Trade Commission's quantity limit ruling on discounts granted by manufacturers of replacement tires and tubes.

On October 20, after a week's postponement, Judge McGuire heard both company and government attorneys argue the motions filed by 20 companies to nullify the FTC action and the government's counter motion to dismiss these company motions. Meanwhile the FTC ruling, which limits quantity discounts to a maximum single carload shipment of

tires and tubes, remains in abeyance; its original effective date, April 7, has been indefinitely postponed by the court.

A recent FTC study on prewar and postwar profit rates, after taxes, published during October, indicated that the tire and inner tube manufacturing industry showed one of the most substantial increases in profit rates from 1940 to 1951 of the 25 industries covered. The survey, which covered 512 companies in 25 manufacturing industries, also showed that all but two industries had lower rates of return in 1951 than in 1950. For tires and tubes, the rate of return jumped from 9% in 1940 to 16.3% in 1951. The report also makes a comparison of the rates of return of the four largest firms in each of the 25 industries with the smaller firms surveyed. In general, the larger firms showed a higher profit rate in 1947-51 than did smaller firms.

DPA Tax Certificates

The Defense Production Administration granted certificates of necessity for rapid tax amortization to the following companies in the rubber, plastics, and associated industries during the period September 24 through October 22:

Plastoid Corp., Hamburg, N. J., plastic insulated wire, $23,160 at 65%, and $52,295 at 65%.

Lee Plastics, Inc., Philadelphia, Pa., jigs, fixtures, and aircraft parts, $13,182 at 70%.

Swedlow Plastics Co., Youngstown, O., aircraft parts, $2,207 at 70%.

United States Rubber Co., Detroit, Mich., military-type tires, $58,563 at 25%.

Continental Oil Black Co., Westlake, La., carbon black, $1,646,500 at 50%.

E. I. du Pont de Nemours & Co., Inc., Niagara Falls, N. Y., adiponitrile, $5,170,000 at 45%; at Belle, W. Va., adipic acid and hexamethylene diamine, $1,630,000 at 45%; at Victoria, Tex., adiponitrile, $33,475,000 at 45%; at Orange, Tex., $4,549,000 at 45%.

Stokes Molded Products, Inc., Yardley, Pa., plastic separators for military-type batteries, $1,549,000 at 60%.

Goodyear Tire & Rubber Co., St. Marys, O., ordnance, $511,030 at 40%. Goodyear Aircraft Corp., Litchfield Park, Ariz., aircraft parts, $55,687 at 65%.

Phillips Chemical Co., Pasadena, Tex., 2-methyl-5-vinyl pyridine, $3,119,000 at 45%.

McNeil Machine & Engineering Co., Summit, O., tire curing presses, $113,674 at 50%.

The percentages following the amounts in dollars in the above is the amount which is allowed for the rapid tax amortization.

Other National News

Natural vs. Synthetic Competition Estimated

The "Natural Rubber News," the publication of the Natural Rubber Bureau, Washington, D. C., in its October, 1952, issue, has provided some interesting comment on the question that the natural rubber growers have to face in evaluating the future market in relation to competition with synthetic rubber.

Using the chart prepared by the Goodyear company showing the areas in which natural rubber and GR-S are preferred and in which price is the determining use factor, the editors of "Natural Rubber News" have developed what they call a "best guess" of the future market in the United States for natural rubber at the present time. In general, the three factors to be reconciled in evaluating the United States market for natural rubber are considered to be *price* (supply and demand and controls), *quality* (the physical and chemical characteristics of the various elastomers, and *use*.

The Goodyear chart is as follows:

AREA OF NATURAL AND GR-S COMPETITION AS OF JULY 1, 1952

Based on
Quality and Price=Value
(Example—Cost Per Mile)

Natural Rubber Preferred Zone

35%

Products Such as—Truck Tires over 7.50, Airplane Tires, Foam Latex, Sheeting, Drug Sundries, Rubber Bands, Belting Carcass

Twilight or Cloudy Zone

(Price Controlling Factor if Supplies Adequate to Permit Free Choice)

35%

Products Such as—Passenger Tire Carcasses, Tractor Tires, Implement Tires, Truck Camelback Over 7.50, Inner Tubes (Butyl *vs.* Natural), Belting Covers, Hose, Etc.

GR-S Preferred Zone

30%

Products Such as—Passenger and Small Truck Tire Treads (Cold GR-S), Flooring, Wire and Cable, Shoe Soles, Tank Lining, Passenger and Small Truck Camelback (Cold GR-S), Molded and Extruded Goods, Wringer Rolls, Industrial Rolls, Certain Fire Hose

"Natural Rubber News" points out that the other factor influencing the mid-zone is government regulation since under the present administrative order a minimum of 450,000 tons of GR-S and 66,000 tons of butyl must be produced and consumed. While these minimums are academic at present, they have the effect of "freezing off" that amount of total consumption from the area of competition. Taking a round figure of 70,000 tons for other synthetics (neoprene 54,000, nitrile types 14,000, special S types privately produced 2,000) and adding this to the 450,000 tons of GR-S and the 66,000 tons of butyl minimums, a total tonnage of 586,000 would be removed from the area of free competition, it was said.

The following two tables were included in the "Natural Rubber News" report:

A "BEST GUESS" OF THE FUTURE U. S. MARKET FOR NATURAL RUBBER
(In 1,000 long tons)

	1952	1953	1954	1955	1956
Total estimated consumption	1230	1287	1343	1400	1458
Less specialty synthetics*	70	70	70	70	70
	1160	1217	1273	1330	1388
Less estimated butyl	70	77	83	90	98
Area of GR-S and natural competition	1090	1140	1190	1240	1290

*Flat figure of 70,000 for all years taken will probably be lower in 1952-1953 and perhaps higher in 1954-1956. It is assumed also that these rubbers are preferred to natural and that price plays very little, if any, part in choice of use between the specialty rubbers and natural rubber.

THEORETICAL PREFERENCE TABLE BASED ON GOODYEAR PERCENTAGES

	1952	1953	1954	1955	1956
Natural preferred	381	399	417	434	452
Competitive zone	381	399	417	434	452
GR-S preferred	328	342	356	372	386
Totals	1090	1140	1190	1240	1290
Maximum potential natural usage*	640	690	740	790	840
Natural Rubber Bureau current estimated probable natural consumption	440	550	600	625	650

*Natural preferred plus competitive zone less difference between 450,000 tons mandatory GR-S use and GR-S preferred.

The bulk of the natural rubber which would be used in the competitive zone would probably be a combination of off grades varying with each individual manufacturer's compounds, but on a weighted price basis averaging considerably below the price for spot #1 RSS, it was added.

For example, a combination of 50% #3 RSS, 45% #2 Browns, 5% Flat Bark might be reasonably representative of the grades going into a passenger-tire compound. Since most of the buyers anticipate their requirements at least three months in advance of delivery date, the three or four month's forward price should be used in making a comparison with GR-S. While the market price of spot #1 RSS, the market measuring stick, is 27½¢ a pound, the price of the grade combination mentioned above for December delivery is 23¢ a pound, or the same price as GR-S. The table below is illustrative of this point, the "Natural Rubber News" said.

NEW YORK MARKET QUOTATIONS
(¢. per Pound)

	Spot	Dec.
#1 RSS	27½	26¼
3 RSS	24⅜	23½
2 Brown	24	23
Flat Bark	19½	18½

A lower-grade combination would, of course, lower the weighted average cost of the compounded, it was said in conclusion.

Humphreys on Government Policy

Speaking before the Fifth Avenue Association in New York, N. Y., September 30, H. E. Humphreys, Jr., president of United States Rubber Co., called on government to develop a firm foreign relations policy that would take the initiative for peace and recommended in support of this policy the removal of seven road-blocks to continued prosperity at home..

He urged the development of a foreign relations policy that "we all understand and support—a firm policy that calls for us to take the initiative for peace. With such a policy, our sons will be able to live for a stronger America—not die for a weaker one."

Next to a positive, forward-looking foreign policy, Mr. Humphreys said, the

best way to solve our problems abroad is to li e right at home and show the world a domestic policy that makes sense.

"I believe the most important question concerned with the economic health and prosperity of our country and our power to support rightness throughout the world is simply this," he said: "Shall we have more government in business, or more business in government?"

He cited the following seven major road-blocks in the path of continued prosperity in the nation today and urged that government and business work together to remove them: unnecessary government intervention in business, tax policies that destroy incentive, the government's failure to recognize the true role of profit, instability of the dollar, failure of many people to accept the fact that full output benefits all people, monopolistic union practices with support of government, and widespread misunderstanding of the American business system.

"We are at a crucial point where we must decide for all time whether we shall speak up and stand up for freedom and opportunity, or whether we shall settle for socialism.

"How far we have gone toward socialism is difficult to measure," he declared. "But, when we look at the amount of our national income that has been going into taxes, it becomes clear that we are moving rapidly in that direction. These figures show that, 20 years ago, we worked only one day in every 23 to pay for federal government spending. By 10 years ago, the figure was one day out of each 11. This year we shall work one day out of four to pay federal taxes."

WSB Approves 10¢-an-Hour Wage Increase; Firestone Contract Dispute Settled

In early October the Wage Stabilization Board announced that it approved the 10¢-an-hour wage increase negotiated in August between the Goodyear Tire & Rubber Co., United States Rubber Co., and The B. F. Goodrich Co., and the United Rubber Workers of America, CIO. The increase was approved retroactive to last August.

A WSB spokesman said the increase, including fringe benefits, will raise to $2.03 an hour the average wage of all production employes represented by the URWA. The figure had been $1.87 previously.

On October 22 the WSB announced further that all rubber companies which follow the wage patterns of the Big Four rubber companies can give their employes a 10¢-an-hour pay increase. This increase may be granted automatically without petitioning the WSB if the company in question provided proof last year that it has been following the Big Four wage pattern. It is the first time that such blanket approval, even of a modified sort, has been granted by the WSB to the rubber industry.

Meanwhile the Firestone URWA members had not as yet ratified the 10¢-an-hour wage increase and the provisions of the new working conditions contract negotiated last August also, because of the objections of two local unions, Akron, O., and Pottstown, Pa., to some of the provisions of the working conditions agreement. The company and the union have been trying to settle this issue, and discussions during the week of October 13 resulted in a clarification of the interpretation of some of the provisions of the contract. A favorable vote on the new interpretation by the Akron and the Pottstown local unions was made on October 26.

The difficulty centered mostly about the section in the contract given below:

"A. During the term of this agreement or any renewal or extension thereof, there shall be no lockout. Any employe who participates in a strike, work stoppage, or slow-down over any dispute which is subject to the grievance procedure shall be subject to disciplinary action, including discharge.

"B. In the event there is any interruption in plant operation due to a stoppage of work or slow-down, the company and the union shall not consider the merits of that dispute, nor shall any arbitration proceed or continue on that matter until such time as the interruption has been terminated."

The above is taken from the original contract, Amended article 11, section 3.

Later W. R. Murphy, industrial relations manager of the company, wrote a letter of explanation to the URWA, as follows: "The term 'slow-down,' as used in the agreement, shall be understood to mean an intentional reduction or restriction of production on the part of one or more employes below a reasonable production rate.

"It is not the intention of the company to take disciplinary action against an employe whose production is reduced if the employe is working at a fair and reasonable pace under the circumstances then existing."

On the basis of this explanation, the URWA union signed the contract and agreed to all other provisions.

Nantz and Vittone in New Posts

Tom B. Nantz has been named manager of B. F. Goodrich Chemical Co.'s new five-million-dollar vinyl plastic monomer plant now in its final construction stages at Calvert City, Ky., reports W. I. Burt, vice president, manufacturing.

Tom B. Nantz

Anton Vittone, Jr., takes over Nantz' former duties as plant manager at the Institute, W. Va., GR-S plant, operated for the government by Goodrich Chemical.

Nantz went to work in The B. F. Goodrich Co.'s laboratories as a chemist in 1937 and in 1940 became a foreman and technical man in one of the company's Akron plants. During early World War II he served as technical service manager of the Lone Star Defense Corp., Texarkana, Tex., operated for the government by Goodrich. He was transferred to the Louisville GR-S plant in 1943 and was production manager until the plant closed in 1946. Nantz served as production manager of Goodrich Chemical's own Hycar nitrile rubber plant in Louisville from 1947 until 1950, when he was sent to reactivate the government owned plant at Institute.

Vittone joined Goodrich in 1942 as a GR-S shift foreman, later general foreman in Louisville, and in 1947 transferred to the Geon polyvinyl chloride plastic resin plant in the same city as a general foreman. He went to England in 1949 to assist in the construction and initial operation of British Geon, Ltd., an affiliate of Goodrich Chemical and in the same year returned to Louisville. He was sent to Institute in 1950 as production manager and a year later Mr. Vittone became plant engineer.

New Plasticizer Plant

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., began production on October 24 in its new Neville Island plasticizer plant—the most recently completed unit in the firm's current $20-million expansion program. This plant will boost the company's plasticizer output to more than a million pounds a month.

Pittsburgh Coke's plasticizer division markets more than a dozen plasticizers—clear, odorless liquids which are added to vinyl resins to make them flexible and "plastic."

Typical of the company's closely integrated operations is the fact that molten phthalic anhydride, a basic ingredient of many plasticizers, is piped directly to the new plant from a nearby phthalic plant. This procedure simplifies production and cuts costs.

Name New Distributer

American Resinous Chemicals and American Polymer corporations, Peabody, Mass., have appointed G. S. Robins & Co., 126 Chouteau, St. Louis, Mo., their representative in eastern Missouri, southern Illinois, western Tennessee, and Arkansas.

The Robins company, founded 29 years ago, maintains a technically trained staff of 12 salesmen calling on users of industrial chemicals, agricultural insecticides, and laundry and dry cleaning supplies. Extensive warehouse facilities also are maintained by the company.

Of particular interest to customers in the paint industry is the complete service available in formulating latex paints. Similar assistance is now available to adhesive compounders in the area through the G. S. Robins staff.

Leiser Named Whittaker Representative

Whittaker, Clark & Daniels, Inc., 260 West Broadway, New York 13, N. Y., importer, manufacturer, and exporter of minerals, colors, and pigments, has appointed D. R. Leiser, vice president of Harry Holland & Son, to represent Whittaker in Michigan. He succeeds R. G. Smith, who has been made an executive salesman in New York to assist W. W. Roff, Whittaker vice president.

Mr. Leiser, after service as an officer in the Navy from 1942 to 1945, entered the employ of Helfrich Laboratories and after two years started with Harry Holland & Son, also in Chicago. He was transferred to the management of the Michigan office in July, 1948.

Financial World Fiftieth Anniversary

With the largest issue in its history, published on October 1, 1952, *Financial World* celebrated its fiftieth year of publishing a weekly magazine written in popular style and devoted to the interests of investors and financial executives.

Throughout the half century *Financial World* has been under the continuous direction of one man, Louis Guenther, who has been its publisher since the first issue appeared as a monthly in October, 1902.

India RUBBER WORLD extends its congratulations to Mr. Guenther and the staff of *Financial World* on its golden anniversary.

In its anniversary issue are articles by G. Keith Funston, president of the New York Stock Exchange, and Edward T. McCormick, president of the New York Curb Exchange.

The heart of the magazine, appearing under the general heading, "Risk for Profit Brings Golden Age to America," consists of 50-year reviews and future prospects of major American industries written by leading security analysts in each field. Of particular interest might be mentioned the article on "Chemicals" by J. M. Bolimfolk, Jr., and on "Automobiles" by A. W. Warde.

Shell Chemical Elevates Huldrum and Irvine

G. W. Huldrum, Jr., has been appointed sales manager, eastern division, of Shell Chemical Corp., 50 West 50th St., New York 20, N. Y.; while V. C. Irvine succeeds him as western division sales manager. Huldrum replaces J. G. Frye, resigned.

In his new position with offices at 500 Fifth Ave., New York, Huldrum will supervise all sales activities east of the Rocky Mountains for Shell's solvents, resins and plastics, and industrial chemicals. Irvine will head sales activities in ammonia and ammonium sulphate, fertilizers, solvents for varnishes and lacquers, plastics and resins, and industrial chemicals, west of the Rockies. His headquarters are at 100 Bush St., San Francisco, Calif.

Huldrum began as a chemist at Shell Chemical's Pittsburg, Calif., plant in 1939 and moved up through various manufacturing and marketing assignments in California, Texas, and New York, to become district manager of the Detroit sales office in 1947. Two years later he returned to San Francisco as manager of agricultural products, western division, and in 1951 was made assistant sales manager, western division, and in March, 1952, sales manager of the division.

Irvine joined Shell Development Co. at the Emeryville, Calif., laboratories in 1934, where he remained until 1943 engaged in research in colloidal and physical chemical problems and on the development of catalysts for both oil and chemical processes. During World War II he represented Shell Development on the Toluene Technical Committee. In 1945, Irvine transferred to Shell Chemical, was named manager of the sales development department in 1946, and was subsequently head of the product development department.

D. R. Leiser

V. C. Irvine

G. W. Huldrum, Jr.

Loomis Talc Distributor

W. H. Loomis Talc Corp., Gouverneur, N. Y., has announced that its fibrous talc mined in the Adirondack Mountains in New York, is being distributed by Whittaker, Clark & Daniels for all industries except the ceramic trade in Massachusetts, Rhode Island, Connecticut, New Jersey, and southeastern New York State.

Army Consults with Thiokol

Thiokol Corp., 780 N. Clinton Ave., Trenton 7, N. J., has negotiated a contract with the Army Ordnance Ammunition Center to act as technical consultant for the reactivation of the Longhorn Ordnance Works, Karnack, Tex. This reactivation involves the rehabilitation of some of the existing facilities, the erection of numerous other buildings, and the installation of production equipment for the manufacture of solid propellants. Thiokol will be responsible for the procurement of equipment and supervision of the installation. Completion of the program is expected some time in 1954.

H. K. Porter Co., Inc., Pittsburgh, Pa., is reported to have purchased **Watson-Stillman Co.,** manufacturer of hydraulic equipment at Roselle, N. J.

Carbon Black Hopper Cars

Columbian Carbon Co., 41 E. 42nd St., New York 17, N. Y., has added 25 hopper bottom cars of new design to its rail fleet for the bulk transportation of Statex brand carbon black. The new all-steel cars, built by Magor Car Corp., are of the closed hopper bottom type and have a capacity of 90,000 pounds of black in the form of free-flowing beads. The new cars, larger than present ones, have more efficient loading and outlet ports, as well as improved spring suspension.

Dow Chemical Co., Midland, Mich., has moved its Los Angeles, Calif., sales office to Statler Center, 900 Wilshire Blvd.

Stein Equipment Co., 90 West St., New York 6, N. Y., on November 1 moved its New York office and combined it with the firm's shop and warehouse at 107-115 Eighth St., Brooklyn 15, N. Y. It is believed that this consolidation of quarters, stock, and activities will result in more efficient and prompter service to customers.

Goodyear Building New Warehouse in Charlotte

General contract for a new district warehouse and office building for the Goodyear Tire & Rubber Co., to be built at Charlotte, N. C., at an approximate cost of $325,000, has been awarded, according to C. A. Plumlee, district manager, who said the company's growing sales in tires and other products made the expansion move necessary.

Away from the congested business district, the new building will be on Jay St., near the city's outskirts and on a siding of the P. & N. Railroad. The structure will be one story, with basement, and will contain a total of 70,000 square feet of storage space, with 15,000 in the basement and 55,000 on the first floor. Offices for sales and operating personnel and a dealer conference room will occupy 8,000 square feet on the first floor, and this entire area will be air conditioned. On a plot of 173,000 square feet, the building will be 261 by 300 feet, of mill construction with exterior walls of brick and frame. The basement will be of reinforced concrete.

Plans for the new building were prepared by the Goodyear architectural division, real estate department, at Akron, O.

Roads Campaign Wins Award

The committee of judges of the 1952 American Public Relations Association Achievement Awards has selected Goodyear's "Better Roads" campaign as the winner in the transportation classification. Goodyear will be given the Association's Silver Anvil Trophy when the annual awards are presented in March. The "Better Roads" campaign began in October, 1951, and has included newspaper and magazine advertisements, television programs, personal contacts, mailings, brochures, direct presentations, and other means of publicity.

Attack Traffic Problems

A united attack on all phases of Philadelphia's traffic problem by the citizens of this area was urged by R. S. Wilson, vice president in charge of sales for Goodyear, in a speech before a civic meeting on September 25 sponsored by the Greater Philadelphia Chamber of Commerce and the National Council of Private Motor Truck Owners. Mr. Wilson emphasized that city street and highways all over the country are inadequate for today's motor transportation and strongly recommended that Philadelphia set up its own city organization of PAR (Project—Adequate Roads)[1] and take full advantage of the National PAR Committee's cumulative knowledge of highway planning and traffic management. Goodyear has been a leader in urging action by citizens to solve immediate and long-term traffic problems.

[1] See INDIA RUBBER WORLD, Apr., 1952, p. 114.

Kelly to Succeed Graham

Thornton G. Graham, vice president of The B. F. Goodrich Co., Akron, O., since 1928, will retire on January 31, 1953, when Arthur Kelly will become vice president-manufacturing.

© Fabian Bachrach

Arthur Kelly

Mr. Graham has been prominently and actively identified with the rubber industry for more than 38 years following his graduation from Princeton University. He became production superintendent of the Goodrich tire division in 1925, division superintendent in 1926, assistant works manager the following year, works manager in October, 1927, and vice president in January, 1928.

His home is in Kent, O., where he has several business interests and where he will continue to reside after retirement.

Arthur Kelly joined Goodrich as a chemist in 1925 shortly after graduation from Purdue University. He served in the compounding and tire construction departments of the tire division and in the technical department of the processing division before being transferred to the company's tire plant in Los Angeles. Next he was in Japan for several years before being recalled to operate new plants established by Goodrich at Oaks, Pa., and Clarksville, Tenn. He returned to Akron as superintendent of Plant 4 in 1941.

During World War II, Kelly superintended the construction and early operations of the Lone Star Ordnance plant, and directed the construction of four government plants for the production of man-made rubbers. Mr. Kelly is now general manager of industrial and aeronautical products manufacturing, with responsibilities for plants in Akron, Marion, and Troy, O., Michigan, Pennsylvania, and Tennessee.

Hager and Tidball Upped

Rollin D. Hager has been appointed general manager of industrial products manufacturing for Goodrich; while Lee D. Tidball succeeds Hager as general superintendent.

Hager will be responsible for company operations in the industrial products and sundries divisions in Akron and at plants at Clarksville, Tenn., Cadillac, Mich., Marion, O., and DuBois, Pa. In 1925 he joined Goodrich as a clerk. In 1937 he was named production superintendent of the company's Cadillac plant and during World War II was production superintendent of the Lone Star Defense Corp., Texarkana, Tex., a large bomb and shell loading plant built and operated for the government by Goodrich. He became assistant general manager and later manager of the defense plant before the war ended. In 1943, Hager returned to Akron to become production superintendent of the industrial products division and was made general superintendent in 1945.

Tidball's first position at Goodrich, in 1922, was at the Miller plant in time study. In 1931 he was appointed supervisor of that work at Plant 4 and eight years later became staff superientendent. In February, 1947, he was made staff superintendent of the industrial products division and in November, 1947, manager of the molded goods department.

Fuel Cell Division Active

The West Coast aircraft fuel cell division of Firestone Tire & Rubber Co., which produced more than 100,000 fuel cells for military aircraft during World War II, is again operating at capacity in turning out more than 200 different sizes and shapes of rubber gas and oil tanks for 30 types of Air Force and Navy aircraft. The largest fuel cells being made are for use in jet bombers; while the smallest cell is a five-gallon tank for a small generator in the B-29. This tank is 19 inches long and 11 inches in diameter. Firestone has other defense projects, including the manufacture of shells, bombs, rocket motors, recoilless rifles, gas masks, life vests, radomes, tank tracks and wheels, tank guns, and naval anti-aircraft guns. The most recent contract permitted to be disclosed is an order for the production of "Corporal E" guided missiles.

Mead and Faunce Advanced

Gordon V. Mead has been promoted to general merchandising manager of the Firestone company; while J. F. Faunce succeeds him as general manager of the home and auto supply division.

Mead, who replaces Victor D. Kniss, who has resigned, entered the Firestone College Training Class in 1929. He served successively as service manager of a store at Tampa, Fla., and as manager of the St. Petersburg, Fla., store, and of stores in Birmingham, Ala., Washington, D. C., and Cleveland, O. In 1935 he came to the home offices in Akron to establish the company's home and auto supply program, which has gradually been expanded to make more profitable the Firestone complete business franchise for independent tire dealers. At first he was in charge of all phases of the program except batteries, brake lining, and spark plugs. In 1940 these portions of the business also were placed under his charge. He now will coordinate the activities of the entire merchandising program of the company.

Faunce came to Firestone as a member of the College Training Class of 1931. After serving as a store manager in the Cleveland district, he came to Akron in 1934 to work on the development of Firestone's home and auto supply program. In 1946 he became group merchandise manager for home supplies.

Barrier-Pribble & Co., Inc., has moved from Fort Wayne, Ind., to 554 Eben St., New Haven, Ind.

Robert L. Bouse is now sales engineer at Bassons Industries Corp., New York, and head of the Philadelphia, Pa., sales office at 401 N. Broad St.

Boston Woven Hose Meeting Includes Plant Trip

Boston Woven Hose & Rubber Co., Cambridge, Mass., one of the leading manufacturers of mechanical rubber goods, may have inaugurated a new type of stockholders' meeting in the rubber industry on October 20, when it invited its stockholders to a tour of its plant in advance of the formal business meeting. More than 200 accepted the invitation of the company president, John M. Bierer, and the plant tour also included the official opening of one of the most efficient rubber reclaiming plants in the world erected during the last year.

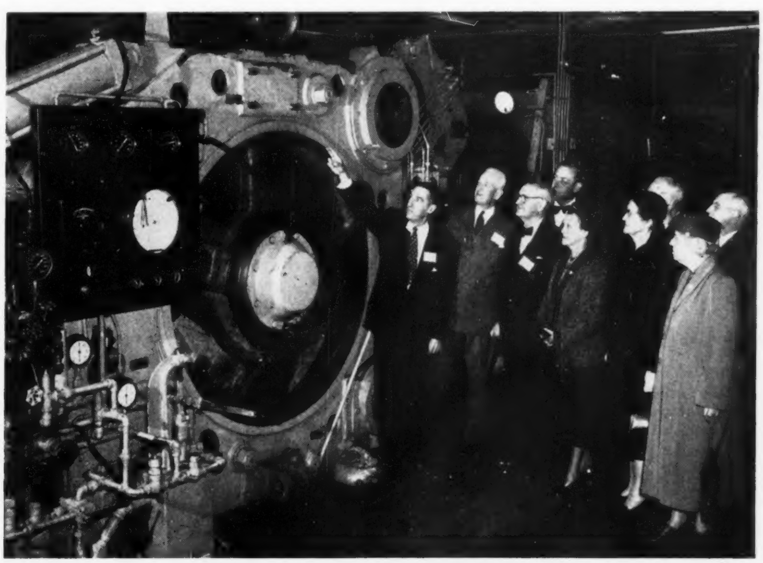
Groups of ten or less were formed and shown the basic raw materials and processes for making various types of mechanical rubber goods. The groups were taken first to the mill room, where they saw where the crude rubber and other ingredients were compounded and processed. From the mill room the visitors went to the tape department and were shown how friction tape was made, cut, and packaged.

The next stop was the belt department, where, as in other departments, the shareholders were greeted by the plant superintendent and given a brief talk on what they would see. The accompanying photograph shows Factory Manager James C. Walton and other officials of the company explaining the operation of a new Rotocure belt curing machine.

The tour also included a trip through the mat department, where packing, stair treads, and floor matting are manufactured, and a demonstration on conductive rubber and a tour through the plastics department. Bullet-sealing rubber hose was also demonstrated. The groups then returned to the new reclaiming plant where they were shown finished products and displays.

Following luncheon, the regular business meeting was held. In the report to the stockholders Mr. Bierer stated that sales and earnings reflected the downward trend in business which was widespread following the scare buying of mechanical rubber goods due to the Korean War. Net income after taxes was $636,159 for the fiscal year ended August 31, 1952, compared with $1,211,454 for the prior year. Sales were the second highest in the history of the company, amounting to $20,684,335 and were exceeded only by the prior year's record sales of $25,769,105. After deducting the preferred dividend and based on the shares of common stock outstanding before the recent stock split, income was equivalent to $6.89 and $3.66 per share for the respective years.

New production facilities have been installed amounting to $1,395,626. Of this amount, $825,863 was for the new reclaiming plant. Notwithstanding the progress the company has made in the field of research and development in past years, the directors recently authorized the establishment of a new research and development department to direct its entire efforts to the discovery and development of new products and the improvement of established product lines, it was said.



New Rotocure Machine Demonstrated to Stockholders by Boston Woven Hose. (*Left to Right*): Mr. Walton; Wm. M. Rand, a Director; Mr. Bierer; Mrs. F. Brittain Kennedy; Mrs. Thomas Allen; Miss Blanche P. Fisher; and *(in Rear)*, W. N. Shepard, General Sales Manager; Robert G. Dodge, Director; and W. L. Larkin, Vice President and Treasurer

Hansell with New Firm

Chemical-Proof Corp. of Los Angeles, a new enterprise, reports that its plant is nearing completion at 12049 Regentview Ave., Downey, Calif., and will house an electrically heated and electronically controlled oven 12 by 12 by 30 feet and also the latest type of blasting equipment. The new company is associated with Chemical Proof Construction, Inc., of San Francisco, Calif., and Seattle, Wash., which holds the western franchise on sales and applications of various "GACO" neoprene and rubber linings and coatings. The Downey facility will be equipped to apply natural and synthetic sheet rubbers, liquid neoprenes, vinyls, and phenolics for plant or field applications.

Vice president of the new concern is Ray Hansell, formerly secretary-treasurer of Fargo Rubber Corp., Los Angeles.

Thurman in New Post

A. L. Thurman

The Aetna-Standard Engineering Co., Pittsburgh, Pa., has appointed A. L. Thurman manager of the plastics and rubber machinery division. Formerly assistant to the vice president, with offices in Ellwood City, Pa., he will now direct the activities of his new position from the Warren, O., plant. Thurman has been with Aetna-Standard since 1945 and was previously a steel mill application engineer for General Electric Co.

Aetna-Standard specializes in the manufacture of seamless tube mills, continuous butt weld pipe mills, and other equipment for the ferrous and non-ferrous industries. The company entered the rubber and plastics machinery business about two years ago when it appointed Hale & Kullgren, Inc., Akron, O., as its engineer and sales representative in that field. Earlier this year Aetna-Standard augmented its business by purchasing the rubber and plastics machinery division of National Erie Corp., Erie, Pa.

Orr and Wolcott Promoted

Stephen T. Orr, vice president of Wyandotte Chemicals Corp., Wyandotte, Mich., and for 25 years in charge of the company's manufacturing and operating activities, has been made a member of the president's staff.

He is succeeded in his manufacturing responsibilities by Frank Wolcott, his immediate assistant, who becomes general manager of manufacturing, Michigan Alkali Division.

Mr. Orr, who started with Michigan Alkali in 1906, when he was graduated from Michigan State College, succeeded his father, William T. Orr, as general manager on October 1, 1927.

Mr. Wolcott joined Wyandotte two years ago as general manufacturing manager, having come to Wyandotte from New Jersey Zinc Co. In his new capacity in charge of Michigan Alkali Division operations, he will report to the company president, Robert B. Semple and will directly supervise the North, South, Kreelon, and Glycol plants, in Wyandotte; the Calvert, Kans., and Blue Mountain, Miss., plants; the Alpena Quarries; and the steamship and coal mining subsidiaries of the company.

Griffith and Ross Upped

Forrest L. Griffith, superintendent of the Passaic, N. J., plant of Hewitt-Robins, Inc., has been promoted to assistant to the general manager of the company's Rubber and Conveyors Divisions. He will be transferred to the Hewitt-Robins executive offices in Stamford, Conn. Mr. Griffith has been with the company since 1948.

Hamilton M. Ross, formerly in charge of plant engineering, takes over Mr. Griffith's duties in Passaic in the new position of plant manager. Mr. Ross has also been in charge of the company's Philadelphia plant and will continue in this capacity also. Mr. Ross started with Hewitt-Robins as a design and layout engineer in 1941.

Expanding Belt Production

Hewitt-Robins recently announced that conveyor belt production capacity at its Buffalo, N. Y., plant will be increased 41% by a new $1,000,000 plant addition scheduled to go into production late in October. The expansion will make the company one of the world's largest producers of conveyor belts. The firm's entire belt manufacturing department is being rearranged to streamline production and utilize new handling equipment. The addition, a building with 12,000 square feet of floor space, has been erected, and machinery is being installed. The new equipment includes a press capable of handling belts up to 72 inches wide for long-haul conveyors used in the handling of coal, ore, and other bulk materials. The widest belt that could be made on the company's old equipment was 60 inches. Dedication ceremonies at the new plant were scheduled for October 25.

More than 2,000 emloyes and their families, along with Mayor Joseph Mruk of Buffalo and Congressman Edmund P. Radwan of the 41st District, attended the "open house" and dedication. The program consisted of speeches, the unveiling of a plaque, a tour of the company's industrial rubber products plant, and refreshments.

Thomas Robins, Jr., president of Hewitt-Robins, said conveyor belts are just entering "a new era of tremendous growth" due to the rising cost of labor and the need of more efficient and economical handling of materials.

Speakers at the dedication included Thomas Robins, Sr., who invented the troughed conveyor belt in 1891 and is a pioneer in the development of the conveyor industry. His first belt was sold to the inventor, Thomas A. Edison, to handle iron ore in a mine operated by Mr. Edison in New Jersey. Mr. Robins, 84, is chairman of the board of Hewitt-Robins and father of the company's president.

Two New Branches for Hewitt

A new headquarters for the western division of Hewitt-Robins, at Los Angeles, Calif., and another for the south central division at Houston, Tex., were opened early in October.

The streamlined one-story buildings, of reinforced concrete, contain offices for sales and engineering personnel and warehouse space for belting, hose, and conveyor equipment. The Los Angeles building, at 2533 Malt Ave., has 13,000 square feet of floor space; while the one at Houston, 5711 Navigation Blvd., has 10,600 feet.

G. V. Migula, western division manager, is assisted by two district managers, Marion D. Austin and James E. Van Stone. L. C. Holloman is manager of the south central division, and John W. Pew is district manager.

George S. Fabel

Fabel Heads Thermoid

George S. Fabel, formerly vice president, has been elected president of the Thermoid Company, Trenton, N. J.

He succeeds Fred E. Schluter, who remains on the board of directors after serving as president of the company since 1935. Mr. Schluter resigned in order to devote more time to outside interests. He stated that he would retain and maintain his interest in the company.

Thermoid manufactures automotive and industrial rubber, asbestos, and textile products in New Jersey, North Carolina, Indiana, Utah, and California.

Mr. Fabel has been with the company more than 30 years. His first job was in the factory in the molded rubber goods department. After holding several supervisory jobs in the factory, he transferred to sales, where he was associated with both the company's automotive replacement and industrial rubber divisions. In 1930 he was appointed vice president and general manager of Southern Asbestos Co., a Theroid subsidiary at Charlotte, N. C. He was later named president of Southern Asbestos and became a director of Thermoid in 1939. He was elected a vice president of the company last spring.

McGavack Succeeds McColm

John McGavack has been appointed technical director of the plantation division of United States Rubber Co., Rockefeller Center, New York 20, N. Y., according to W. E. Cake, managing director of the division. Dr. McGavack succeeds E. M. McColm, who is transferring to research and development work at the general laboratories in Passaic, N. J.

In his new position Dr. McGavack will direct the plantation division's research and development work. He will supervise its technical service on sales of latex and dry rubber grades and will control the technical aspects of latex and rubber processing and latex shipment, storage, and handling. He has been with the company since 1920 and since 1936 has headed the crude rubber and latex department at the general laboratories.

Willard in New Post

Henry W. Willard has been appointed factory manager of United States Rubber Co.'s Passaic, N. J., plant, succeeding William C. Bowker, who retired September 30.

Mr. Bowker started in the Passaic factory as a clerk in 1905. Later he was transferred to the central offices in New York, N. Y., and in the 1920's managed the company's Cleveland and Chicago factories. He returned to the Passaic plant in 1930.

Mr. Willard, 41 years old, started with the rubber company in 1929, working as an office boy during summer vacation. In 1934 he began as a time clerk in the Passaic plant and since then has held a wide variety of positions. He was promoted to general superintendent on May 19, 1950, and assistant factory manager on January 2, 1952. While with the United States Air Force, Willard attained the rank of lieutenant colonel on active duty in the Southwest Pacific theatre.

The Passaic plant of U. S. Rubber employs more than 3,000 persons in the manufacture of hose, belting, packing, and miscellaneous rubber products.

Tenth Anniversary of Naugatuck Synthetic Plant

In the short space of a decade, chemical research has broken the century-old reign of natural rubber as the single basic raw material of the rubber industry, John P. Coe, vice president and general manager of the Naugatuck Chemical Division, U. S. Rubber, said in celebrating the tenth anniversary of the Naugatuck synthetic rubber plant. Designed and built by the company almost entirely on the basis of laboratory research with brief pilot-plant experience the plant produced more than 2,500 tons of synthetic rubber per month only 18 months after completion and by V-J Day was producing at the rate of 42,000 tons per year.

Since the war the Naugatuck plant has concentrated on the production of new types of synthetic rubber. About 60% of current production is latex.

"Today, the future of the rubber industry as we know it lies not only with natural gum rubber, but with the industry's scientific knowledge and developmental ability in the field of chemically-made rubber and its first cousins, the plastics," Coe said. "The rubber industry now has hundreds of raw materials that can be tailor-made to fit its exacting requirements. Rubber, plastics, and synthetic rubber, with a common meeting ground in chemistry, are being brought closer and closer together from a technical viewpoint."

Golden Bear Mfg. Co., Inc., has changed its name to Kraloy Plastic Pipe Co., Inc., 4710-20 E. Washington Blvd., Los Angeles 22, Calif.

Tri-Angle Tool & Machine Works, designer and manufacturer of steel molds for the rubber industry, has moved its shop and office to new and larger quarters at 8623 Dice Rd., Los Nietos, Calif.

NEWS ABOUT PEOPLE

R. E. Horsey

R. E. Horsey has been appointed vice president in charge of sales for Givaudan-Delawanna, Inc., and its affiliate, Sindar Corp. both of 330 W. 42nd St., New York 36, N. Y. This appointment will consolidate the sales management of both companies. Mr. Horsey joined the Givaudan organization in 1943 as manager of its industrial products division. When, in 1948, the sales functions of this division were absorbed by Sindar Corp., a newly formed associate company, Mr. Horsey was appointed sales manager.

Jack D. Porter has been named to the sales promotion department of the Goodyear Tire & Rubber Co., where he will coordinate the advertising and sales promotion activities of the chemical products division. He has held a variety of production posts since joining the company in 1933 and is a graduate of the Goodyear production training squadron. He went to the public relations department in 1940, and when Goodyear became operator of the government owned powder bagging plant at Charlestown, Ind., in 1942, Porter was made public relations representative for that operation. He entered military service in 1943 and returned to Goodyear in 1946 to become manager of airship advertising. He moved to Goodyear Aircraft Corp. in 1950 to the airship advertising sales division. The following year Porter was transferred to the priorities division of Goodyear Tire and earlier this year assumed his duties in display advertising.

Elmer French, since 1951 vice president of Firestone Plastics Co., Pottstown, Pa., resigned effective October 1. Mr. French had joined The Firestone Tire & Rubber Co., Akron O., in 1941 in the retail sales division. In 1947, Mr. French went to Firestone Plastics when that company was formed as a subsidiary of the parent organization.

Archie H. Dean recently resigned as director of sales, Barrett Division, Allied Chemical & Dye Corp.

William B. Guffey has been appointed traffic manager of United Engineering & Foundry Co., Pittsburgh, Pa., to succeed **Leonard G. Hults,** who retired on October 1 after 46 years with the company. Mr. Guffey started in the traffic department in 1939 and for the past several years was Mr. Hults' assistant. Mr. Guffey will have charge of all transportation and traffic problems.

Charles E. Vose, who in September completed his twenty-seventh year of active service as traffic manager for the Cabot companies, has retired, but will continue to be associated with Cabot as a traffic consultant. Suceeding him as traffic manager is **Lee Cisneros,** formerly with the traffic department of Cabot Carbon Co., a Texas subsidiary of Godfrey L. Cabot, Inc., and for the past two years assistant traffic manager under Mr. Vose, with offices at Boston, Mass., headquarters, 77 Franklin St.

Robert K. White has joined Libbey-Owens-Ford Glass Co. as a merchandising specialist for its plastic markets' products.

Raymond H. Hartigan has been appointed assistant director of research on the executive staff of Mellon Institute, Pittsburgh, Pa., and will participate in the management of activities of the organization. Dr. Hartigan in 1941 joined Mellon Institute as a Fellow on one of the research programs sustained by Koppers Co., Inc., and six years later was made a Senior Fellow. In 1950 he became manager of the laboratory section of the Koppers research department. A year later he returned to Mellon Institute as an Administrative Fellow and in this position has been supervising the investigations of the various Fellowships supported in the Institute by Koppers. Dr. Hartigan's major training and experience have been in the field of organic chemistry. He is a specialist on the organic compounds of nitrogen and sulfur, including cyanogen and thiocyanogen derivatives. He has contributed to the literature of that division of chemistry and has also had issued to him a number of patents relating to the manufacture of cyanogen compounds, and melamine.

Willis A. Mitchell, international sales representative, B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, O., is now making a regular scheduled business trip through six European countries. He will observe and evaluate present sales conditions in France, Germany, Denmark, Finland, Norway, and Sweden. Mitchell visited the first postwar plastics show at the German Plastics Exhibition, Duesseldorf, October 11-19 and will climax his trip by speaking before the fall meeting of the Swedish Institute of Rubber Technology, Stockholm, November 14, on "Oil Resistance of Nitrile Rubber."

E. A. Casey, assistant chief engineer for Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y., was a guest speaker at the recent meeting of the Kansas Association of Municipal Utilities, Wichita, Kan. Mr. Casey discussed aluminum conductors.

R. E. Vicklund

R. E. Vicklund has been made manager of sales and development for Sindar Corp., 330 W. 42nd St., New York 36, N. Y. Mr. Vicklund, who had joined the corporation in 1950 as a technical representative, most recently was chief of the fungus control section of engineer research and development laboratories, where he supervised the development and research program on the deterioration and preservation of textiles, paints, rubber, plastics, and other material.

Walter F. Brown, formerly district manager in Los Angeles for U. S. tires, has been promoted to manager, market development, United States Rubber Co., with headquarters in the company's general office in New York.

Paul T. Carroll, since 1949 senior staffman in the advertising department of Goodyear Tire & Rubber Export Co., Akron, O., has been named assistant manager of the department. He started with Goodyear in Akron as a member of the production squadron in 1940; the following year transferred to mechanical goods production control; at the beginning of World War II was a member of the Fifth Air Force and served in the Pacific Theatre; resumed his position in production control with Goodyear in Akron in 1945, and later that year was shifted to the Export company's advertising department as staffman, to become senior staffman four years later.

T. C. Keeling, Jr., assistant vice president and sales manager of the chemical division, Koppers Co., Inc., is now serving as deputy director, chemical division, National Production Authority, Washington, D. C.

William Person has joined Baird Rubber & Trading Co., Inc., 233 Broadway, New York 7, N. Y., in a sales capacity. He first was with the company from 1938 to 1940. From 1941 to 1947 he served as a captain-pilot for American Airlines, then joined South Asia Corp. He resigned as its treasurer in June, 1952.

Newton H. Tuthill was elected vice president of Pequanoc Rubber Co., Butler, N. J., at a board meeting on October 2. Mr. Tuthill joined Pequanoc as assistant treasurer in 1947 after a transfer from the parent company, American Hard Rubber Co. He was elected secretary treasurer in 1948 and will continue in this office while assuming the additional duties of vice president.

Harry C. Oliver has been appointed sales manager of U. S. Tires, United States Rubber Co., tire division. Mr. Oliver, assistant sales manager since January 1, 1952, will maintain offices in New York, N. Y., and succeeds **Lawler B. Reeves,** now manager of the newly formed oil marketer sales division. Oliver started with the rubber company in 1939 as territory salesman in the eastern sections of North and South Carolina, and in 1940 was moved to Atlanta, Ga., as assistant district manager, becoming district manager the following year. During 1943 and 1944, Oliver had charge of the Memphis-New Orleans district, returning to Atlanta in the same capacity in 1945. On January 1, 1951, he was transferred to Los Angeles as district manager and later was promoted to western divisional sales manager.

Desiree S. Le Beau, director of research of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., has been elected chairman of the American Chemical Society's Division of Colloid Chemistry for 1953, a post which she also held in 1949.

Myron C. Meyer, promoted to manager, wire braid hose sales, for the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O., will direct the sales activities of the division's new line of wire braid hose now being produced in a new $2,500,000 plant addition. Mr. Meyer began with Republic in 1918 in the physical testing laboratory, transferred to the sales department in 1932, and from 1933 to 1938 acted as a territory salesman in Ohio, Michigan, and Indiana. In 1938 he was reassigned to Youngstown where he has held the successive positions of assistant sales manager, traveling sales manager, and assistant to the sales manager.

Kenneth T. Barker is chief engineer for Shore Line Industries, Clinton, Conn. He was formerly doing chemical engineering plant design for DeBell & Richardson, Inc.

Kenneth L. Edgar has been appointed sales manager of Velon products, Firestone Plastics Co., Pottstown, Pa., to succeed Elmer French, resigned. Mr. Edgar joined Firestone in 1940 as a chemical engineer in the general laboratories and during the war years, 1941 to 1945, headed a development section on non-metallic bullet-sealing fuel cells. In 1945, Mr. Edgar was one of the first to join the newly formed vinyl sheetings division of the Firestone Industrial Products Co., out of which later grew Firestone Plastics Co. In 1946, Mr. Edgar was the Firestone film sales representative in the New York and New England area and in 1948 manager of Velon film sales. Early this year Mr. Edgar was appointed manager of the Velon sheetings division.

Photo by Wood

Henry A. Hill

Henry A. Hill has been appointed assistant manager of National Polychemicals, Inc., 131 Clarendon St., Boston, Mass., and will be responsible for all manufacturing and technical activities of the company, according to Edward V. Osberg, general manager. Dr. Hill comes to National Polychemicals from the Dewey & Almy Chemical Co. Before that he had been director of research for Atlantic Research Associates and vice president of National Atlantic Research Corp. Dr. Hill is a member of the American Chemical Society and the American Association for the Advancement of Science. National Polychemicals, recently organized to manufacture specialty organic chemicals, is building a plant in Wilmington, Mass., for its various projected manufacturing operations, the first of which is expected to be "on stream" early in 1953.

John H. Seaton has been named superintendent, aircraft wheel and brake manufacturing, for The B. F. Goodrich Co., and will make his headquarters at the company's airplane wheel and brake plant in Troy, O. Seaton joined Goodrich in 1927 in the physical testing laboratories, transferred to the industrial products division the same year, and later served on various technical assignments before becoming the division's chief design engineer in 1942. In February, 1946, Seaton was named general manager of the aeronautical manufacturing division.

Charles S. Harding, for 13 years in charge of development and applications of new products for Dewey & Almy Chemical Co.'s shoe products division, Cambridge, Mass., retired October 27 under the company's plan. At Dewey & Almy, Mr. Harding developed new applications for the company's shoe making materials, including synthetic welting for prewelt and American-welt shoes and invented many tools to improve manufacturing processes. At a farewell party at the Boston Yacht Club, he was presented with an air-conditioning unit for his new home in St. Petersburg, Fla.

Oliver H. Clapp last month resigned as a vice president and a director of Stein, Hall & Co., Inc., 285 Madison Ave., New York, N. Y.

Chester H. Peterson has been elected executive vice president of U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y. He started with the company early in 1950 as factory manager.

Frank E. Daley, formerly ceramic engineer for American Standard Co., has been placed in charge of sales of wollastonite to the ceramics industry for Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. Mr. Daley's offices will be at 10 Greenland Ave., Trenton, N. J.

Albert E. Sidnell has been assigned to the newly created post of assistant to the president of The Buxbaum Co., Canton, O., manufacturer of automotive and household rubber products. Mr. Sidnell previously had been vice president and factory manager of Seiberling Latex Products Co., Barberton, O. He was also a director of the company and had been with it 22 years.

Richard L. Moore, assistant treasurer of Foster D. Snell, Inc., New York, N. Y., has been elected secretary-treasurer of the New York Chapter, American Institute of Chemists.

Harvey H. Morrison has joined Stillman Rubber Co., 5811 Marilyn Ave., Culver City, Calif., as vice president in charge of production. He was formerly vice president in charge of production at Los Angeles Standard Rubber Co. for five years, and for four years factory superintendent, Plastic & Rubber Products, Inc. Previously he had been with Kirkhill Rubber Co. as factory superintendent for six years. Stillman Rubber is engaged in custom molding of precision parts for aircraft, automotive, petroleum, and other industries. The company produces a wide range of custom molded parts and products including O-Rings to commercial and government specifications.

George C. Chatfield is now advertising manager of Seamless Rubber Co., New Haven, Conn. He had gained his previous business experience with Olin Industries and Lehigh Valley Railroad.

Harry Slanta, for the past seven years a machine designer at Goodyear Tire & Rubber Co., has returned to Goodyear Aircraft Co., both of Akron, O., as assistant manager of the tool engineering division. Slanta was with GAC from 1941 until 1945 as a tool designer and later as manager of the tool liaison and project engineering department. He had joined the Goodyear Tire production squadron in 1929 and was transferred to the machine design department in 1933, where he remained until his move to Aircraft.

Paul R. Herholz, section head in the production engineering department, has been named manager of the tool engineering staff department, in charge of processing, tool planning, and designing. He started in Goodyear Tire production operations in 1933, was shifted two years later to the production squadron, was assigned drafting duties in 1939, a year later was sent to GAC in the same capacity, and in 1942 was made manager of the liaison engineering department, where he served until the end of World War II. For the past six years he was a member of production engineering.

Charles J. Ford, manager of mechanical goods sales in Goodyear Tire & Rubber Co.'s aviation products division since June, has been assigned to sales and promotion of rubberized fabric products besides his present duties in sales and promotion of aircraft deicing equipment, aircraft hose, and molded and extruded products for the aircraft industy. He will now operate as manager of a department of Goodyear's aviation products division under E. M. Eickmann, division manager. Ford joined Goodyear in balloon assembly work in 1941, became a draftsman in 1943, and then served successively as development engineer and junior engineer in rubberized products. In 1944 he was transferred to Goodyear Fabric Corp., Woonsocket, R. I., as development manager, but returned to rubberized product develment and design in Akron as senior engineer in 1945, and two years later became senior development engineer. Ford was appointed section head in the rubberized fabric design department in 1948 and in May, 1951, became department manager of rubberized fabric development.

L. F. Hickernell, chief engineer at Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y., has been appointed chairman of the technical program committee for the 1953 winter general meeting of the American Institute of Electrical Engineers, to be held January 19-23 in the Hotel Statler, New York, with an estimated attendance of more than 4,000 of the nation's leading engineers, scientists and research men and women.

James N. Grove has joined the New York, N. Y., office of Plaskon Division, Libbey-Owens-Ford Glass Co.

Willard deCamp Crater, for six months chief of the Thermoplastic Section, National Production Authority, has returned to Naugatuck Chemical Division, United States Rubber Co., to his post as assistant sales manager of Marvinol vinyl resins. He is succeeded in Washington by **Wm. W. Flannigan,** technical service manager, international sales department, B. F. Goodrich Chemical Co.

Raymond S. Jenkins has been appointed New England district field manager for The B. F. Goodrich Co.'s associated lines division and will be in charge of marketing activities in the six New England states for the Hood, Miller, Diamond, and Brunswick lines of tires and Miller automotive accessories. With Goodrich since 1933, Jenkins has held a variety of important assignments in sales, credit, operating, and service.

Wayne H. Hunter has been appointed assistant sales development manager of the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown 1, O. He will assist J. M. Hughes, sales development manager, in the advertising, sales promotion, and sales training phases of merchandising Republic's belting, hose, pack ing, and molded rubber products. Mr. Hunter joined Republic in March, 1949, and in August was transferred to St. Louis, Mo., as field engineer. He was reassigned to the Youngstown sales department in December, 1951, and joined the sales development department in March, 1952.

Fred E. Wiley is again with DeBell & Richardson, Inc., Hazardville, Conn., in charge of mechanical engineering and test procedures.

Sven Richter is handling chemical engineering plant design for the same company. A consulting engineer, Mr. Richter was formerly manager of the chemical department of Svenska Oljeslageri AB, Gothenburg.

OBITUARY

William H. Dunn

WILLIAM HENRY DUNN, retired executive of Raybestos-Manhattan, Inc., Passaic, N. J., died September 29 at his home in South Orange, N. J., at the age of 69.

A native New Yorker, he was graduated from the College of the City of New York.

Then he joined the staff of Price, Waterhouse & Co., handling the account of the former Manhattan Rubber Mfg. Co. With this experience he went to Manhattan as comptroller on July 1, 1916, later becoming also assistant treasurer. Mr. Dunn was named a member of the executive committee in 1937, a director in 1939, secretary also that same year, and treasurer in 1941. He retired as treasurer and director in 1950.

The deceased was also a former treasurer of The Rubber Manufacturers Association, Inc., and of the Friction Material Institute. During World War I he was consulting accountant for the Treasury Department in Washington.

Solemn High Mass of Requiem was sung on October 2 at Our Lady of Sorrows Church,, South Orange, followed by private interment.

Survivors include the widow, a son, and a daughter.

Fred H. Haggerson

FRED H. HAGGERSON, chairman of the board of Union Carbide & Carbon Corp., New York 17, N. Y., died at a hospital in that city October 14, following a short illness.

Mr. Haggerson was born in 1884 in Spalding, Mich. He attended high school in Menominee, Mich., Holbrook School, Hamilton College, and the Law School of the University of Michigan, from which he was graduated in 1907.

After graduation the deceased practiced law in Menominee and within two years became district attorney for that county. In 1917 he was appointed to the Bureau of Investigation, United States Department of Justice, Cleveland, and later was transferred to its New York Office as division superintendent, where he remained during World War I.

In February, 1919, the deceased became associated with the law department of Union Carbide, was made vice president of that company in 1938, a director in 1941, president and a member of the executive committee in 1944, and chairman of the board in 1951.

In 1949, because of his outstanding leadership in the field of metals, Mr. Haggerson was awarded the Medal for the Advancement of Research, presented by the American Society for Metals. He was also awarded the degree of Doctor of Laws by Hamilton College and the degree of Doctor of Commercial Science by New York University, both in 1950.

He was a director of the Sault Ste. Marie Terminal Railroad, a trustee of Hamilton College and the Hanover Bank, and a member of the Links Golf Club, the Links Club of New York, National Golf Links of America, Royal & Ancient Golf Club of St. Andrews, Scotland, U. S. Seniors Golf Association, Pine Valley and Seminale golf clubs, and Ristigouche Salmon, Southside Sportsmen's, and the Jupiter Island clubs.

Funeral services were held October 16 at the Congregational Church of Manhasset, with private interment following at Nassau Knolls, Port Washington, N. Y.

One son, a daughter, two grandchildren, and two sisters survive.

P. J. S. Cramer

P. J. S. CRAMER, 72, a once well-known figure in the plantation world of the Far East, died suddenly in Holland earlier this year. Professor Cramer, who was a pupil of the famous Dutch botanist, Prof. Hugo de Vries, was connected with the Department of Agriculture of Indonesia for all but two years of the period 1905-1928. He is remembered amongst the older generation of planters for his work in behalf of the coffee industry in Java and as the man whose encouragement and guidance were responsible for the success of the first attempts at budgrafting *Hevea* rubber made by van Helten and Bodde in Java in 1916.

After leaving the Far East, the deceased returned to Holland, eventually joining the faculty of the University of Utrecht, where he lectured on tropical agriculture.

Cramer was not only an able botanist, but an excellent organizer and sound economist whose advice was sought by companies and institutes in Belgium, France, and England as well as in Indonesia.

Sir Walrond Sinclair, K.C.B.

AFTER a prolonged illness Sir Walrond Sinclair, K.C.B., president of the British Tire & Rubber Co., Ltd., died at the age of 72 on August 30, 1952, in a London nursing home. Sir Walrond, who in 1924 joined the newly formed concern, then known as the British Goodrich Rubber Co., Ltd., served as its chairman from 1927 until his resignation not long before his death; he was elected president after his resignation. The company developed rapidly under his administration and now holds controlling interest in about a dozen well-known British manufacturing firms in rubber and allied branches. The deceased did valuable work for his country in both World Wars; his efforts in the earlier war earned for him the K.C.B., Military Division, in 1918. Among the various offices he held may be mentioned: president of the Tire Manufacturers' Conference (1930-1936); president of the Institution of the Rubber Industry (1939-1945); president of the Federation of British Rubber Manufacturers' Associations (1943-1944). He was also chairman of British Geon, Ltd., and for many years was a director on the board of The B. F. Goodrich Co., of Akron, O.

A wife and a daughter survive him.

New Machinery

Stripomatik Portable Rubber Cutter

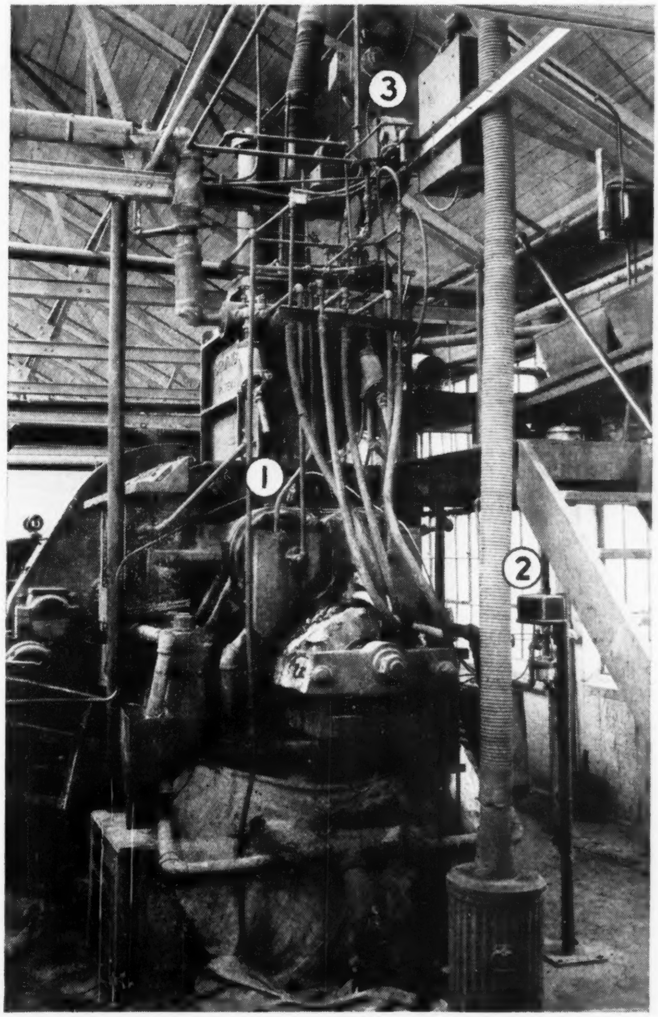
Portable Rubber Cutter

A HEAVY DUTY portable cutting machine that can quickly and accurately cut rubber of 95 durometer hardness and thicknesses up to two inches has been announced by H. Maimin Co., Inc., 575 Eighth Ave., New York 18, N. Y. Called the Maimin Stripomatik, the cutter was designed specifically for use on rubber and composition materials and is said to have the most powerful motor ever incorporated into a cutter machine.

The cutter is completely self-contained and has a water feed attachment to lubricate and cool the blade. Special rollers help reduce friction and speed up cutting. A durable and simple gage holds the rubber firmly and assures that each strip is cut to industrial tolerances. Other features include self-sharpening mechanism; two-handed control for steadiness; and bronze base plate and blade support for rigidity and durability. Easy passage of the blade through the rubber is facilitated by the position of the knife support behind the machine, instead of at the side.

The Stripomatik can be used either as a single unit, or in multiple installations as gang cutters to cut and edge trim in a coordinated operation. The cutter can be supplied with special modifications to meet individual applications. Maimin also makes a similar lightweight cutter for cutting and trimming soft rubber in layers up to 1 9/16 inches thick.

More Accurate Banbury Temperatures with new Transmitter



How accurately can you measure the temperature of the tough mix inside your Banbury Mixer? Routine laboratory checks prove that the recorded temperatures measured by the TRANSAIRE* Temperature Transmitter are within 2° to 4° of the actual. Moreover, it practically eliminates time lag in the difficult measurement problem, and is so fast and so precise that it gives an accurate record of both the temperature and time of every batch.

The TRANSAIRE force-balance temperature transmitter has created new standards in the measurement of dynamic or changing temperatures. It gives you dynamic compensation for inherent legs both in the measuring system and the rate of heat transfer of the process medium.

The system shown here is installed in the plant of a well known manufacturer of mechanical rubber goods, who are just one of a rapidly growing list of enthusiastic users. It is giving them records of each batch in the Banbury that are most accurate and an improvement over results previously obtained. Because of its rugged temperature sensitive bulb, maintenance is negligible. Ask your Taylor Field Engineer to show you how you can do the same. Taylor Instrument Companies, Rochester 1, N. Y. and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade mark

HERE'S HOW IT WORKS: The tiny temperature-sensitive bulb is installed through the wall of the mixer at point 1, about 1½″ into the mix just above the rolls. Impulses from the bulb are converted to output air pressure by the TRANSAIRE Transmitter at point 2, and relayed to a recorder mounted by the catwalk at point 3. Recorder makes a permanent record of true temperature and *actual time* of each batch.

Taylor Instruments

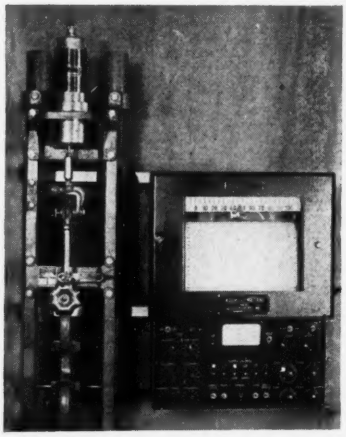
MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

Load Weighing Device for Testing Machine

THE Accr-O-Meter, a force measuring or load weighing device for connection to any standard Scott tester of the constant-rate-of-traverse type, has been announced by Scott Testers, Inc., Providence 1, R. I. Employing an unbonded strain gage, the Accr-O-Meter makes possible the study of materials under conditions of extreme accuracy and sensitivity. The device features interchangeable force dividers (elastic spools) which permit the study of materials ranging from microscopic cross-sections to complete constructions on a single instrument. The plot of the test is drawn continuously on a strip chart recorder capable of magnifying small differentials for ready evaluation.



Accr-O-Meter Load Weighing Attachment for Scott Testers

The load measuring head is a small, rigid assembly composed of a strain gage and force divider and is connected to the top of the testing machine. Force dividers are available in a series of maximum rated capacities ranging from 0-1 to 0-2,000 pounds and from 0-50 to 0-1,000,000 grams. In each case the minimum capacity is 1/10 the maximum rating, but any value between the rated limits may be extracted from the calibration curve, and the recorder adjusted to make this quantity 100% of recorder span. The recorder is a specialized modification of a commercial potentiometer type. The signal transmitted by the strain gage causes the pen to move horizontally a distance proportional to the load, while the chart is driven at a speed synchronized to the pulling clamp of the testing machine. These two factors result in a permanent stress-strain curve plotting. All controls are grouped on a panel mounted beneath the recorder. Optional equipment available includes variable speed drives for the recorder; quick change heads for the force dividers; variable speed clamp drives; and console mounting of the recorder and controls.

New Materials

Reinforcing Pigment—Zeolex 20

COMMERCIAL quantities of Zeolex 20, a new white reinforcing pigment, are now available from J. M. Huber Corp., 100 Park Ave., New York 17, N. Y. According to R. H. Eagles, Huber vice president, the new material, a calcium zeolite, has wide reinforcing applications in rubber and plastic stocks. Uses in a variety of other industries are also under study. Properties of Zeolex 20 are as follows: specific gravity, 2.2; 325-mesh screen residue, 0.1% maximum; pH, 9.5-10.5; moisture content, 5% maximum; ignition loss, 13-15%; oil absorption, 105-110 cubic centimeters per 100 grams; and particle size, 0.01-0.05-micron.

Decals for Rubber Products

THE development of a special-type decal for practical and economical marking or decoration of rubber products has been announced by American Decalcomania Co., Chicago, Ill. Called Rubber-Cal, the decal provides maximum adherence to most types of rubber surfaces and is said to be indistinguishable as a transfer. Rubber-Cal can be printed in any number of colors, is available in any size or shape, and in both open type and solid background styles. Easily applied with production-line speed, the decal adheres immediately to rubber surfaces, is highly durable, flexible, abrasion resistant, and washable and allows immediate packaging of the product to which it has been applied.

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New Goods

Examining General's New Jumbo 14 Tire Are *(Left)* H. A. Bellows, Vice President, and *(Right)* A. R. Carr, Manager of Passenger Tire Sales

Ultra-Low-Pressure Tire

A NEW ultra-low-pressure automobile tire, the Jumbo 14, has been announced by The General Tire & Rubber Co., Akron O. The new tire carries only 14 pounds of air, as compared to the 24 pounds of a standard low-pressure tire, and was designed specifically for Fords and Chevrolets. The tire was developed to meet the need of owners of small cars for the riding comfort of larger cars.

Engineered for greater safety, the Jumbo 14 is wide at the base or rim and tapers down to the conventional tread. As testimony to its strength, the new tire is said have been driven into high curbs and deep chuck holes at speeds of 70 miles an hour without bruising or breaking. The ultra-low-pressure feature gives additional blowout and puncture protection and reduces car maintenance by soaking up road vibration.

New Goodyear Life Raft

A 20-MAN life raft, to be carried in air transports, is being produced by Goodyear Tire & Rubber Co., Akron 16, O., for the Air Force. Automatically inflated by carbon dioxide, the raft can be inflated and ready for use in about 30 seconds. The raft is circular in design, identical on top and bottom, measures 12½ feet in diameter, weighs 108 pounds, and is only 36 by 18 by 18 inches in its carrying case. In emergencies, the raft is dropped

20-Man Life Raft for Air Transports

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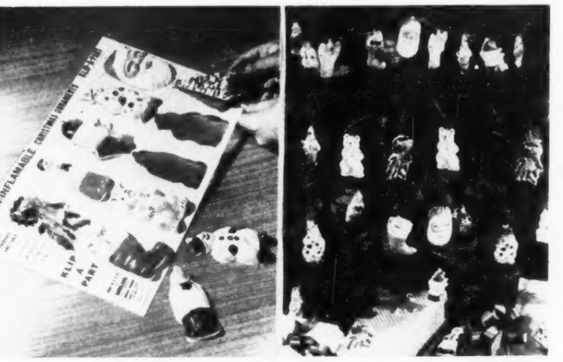
from the aircraft while still in its carrying case, and a rip cord automatically discharges the gas to inflate the raft.

A feature of the raft is the portable nylon canopy which can easily be attached to the outer edge of the raft. The canopy has two port holes, and an elastic lining at the bottom to insure a snug fit to the raft. Reversible, the canopy is camouflaged greenish-blue on one side, while the other side is a brilliant red for signaling purposes. Provision is made for attaching a radar reflector to the canopy mast. Made of rubber coated nylon fabric, the raft has withstood rigid tests by Goodyear and the Air Force in high seas and winds, and at temperatures from —65 to +160° F.



Formed Plastic Christmas Ornaments *(Left)* Being Removed from Die-Cut Sheet and *(Right)* Installed on Tree

Christmas Tree Decorations

NEW-TYPE plastic ornaments for Christmas trees and gifts that save merchandising space and are inexpensive are being produced by Borkland Mfg. Co., Marion, Ind. Molded in three dimensions of colorfully printed Vinylite rigid vinyl sheet, made by Bakelite Co., the ornaments are said to be light in weight, non-flammable, and easy to wash. The plastic sheet has exceptional dimensional stability, enabling the cartoon-style ornaments to resist deformation in packing, shipping, merchandising, or service, it is also claimed.

Ten attractively colored ornaments, each measuring approximately 2¼ by 3¾ inches, are formed in a 9- by 15-inch sheet and die cut so that they can be easily clipped or pushed out by hand. Each Santa Claus face and boot, angel, snowman, or other ornament has a die-cut eyelet at the top which permits stringing on the tree or tying around gift packages. The ornaments, moreover, are translucent and achieve further decorative effect by having the tree lights glow through them. The ornaments are also available in a smaller size, with nine to a 9- by 11½-inch sheet. The sheets nest together to save counter and storage space.

"Flowed-in" Gasket

A NEW type of gasket which is said to provide an improved seal at lower labor and material costs is being produced by Dewey & Almy Chemical Co., Cambridge 40, Mass., as a replacement for conventional precut cork or rubber gaskets. Called the "flowed-in" gasket, it is applied as a liquid synthetic rubber or resin compound which is forced through a nozzle on to the spinning component part and then is baked to form a solid rubbery gasket which will not fall off the part. The gasket can be applied either automatically or semi-automatically, depending on the lining equipment used, and in different types thicknesses, and diameters.

On the automatic lining machine, which can apply gaskets at speeds up to 300 parts a minute, depending on size, the parts are belt or gravity fed to the machine and then to the chuck. The chuck spins the part under an adjustable nozzle which squirts a precisely measured amount of compound into a groove or channel in the part. The lined part then moves off on to a conveyor belt to an oven where it is baked. On the semi-automatic machine, the part is manually placed on the chuck which is foot pedal controlled. After lining, the part is manually moved for the baking operations. This machine requires a single operator and can handle up to 50 parts a minute.

PLASTOLEIN 9050 DHZ—(di-2-ethylbutyl azelate)—a highly-efficient specialty plasticizer for high clarity vinyl films, coated fabrics, extrusion compounds and other elastomers where low-temperature flexibility is essential. Excellent for non-thickening dispersions.

PLASTOLEIN 9058 DOZ—(di-2-ethylhexyl azelate)—a good all around basic plasticizer that also imparts excellent low temperature properties. Its outstanding combination of properties leads to its use in any vinyl product. Also advantageous for nitrile and GR-S rubbers.

PLASTOLEIN 9055 DGP—(diethylene glycol dipelargonate)—a general purpose auxiliary plasticizer for imparting low-temperature flexibility, excellent "hand" and drape to vinyls. Also, an outstanding low-temperature plasticizer for Neoprene and Buna-N rubbers.

PLASTOLEIN 9250 THFO—(Tetrahydrofurfuryl oleate)—a fatty type plasticizer of unusual stability, providing internal lubrication for superior processing. Also imparts excellent "hand" and drape to vinyl films and sheeting. Its relatively low cost makes it attractive for cellulosics, particularly nitrocellulose, and synthetic rubbers.

PLASTOLEIN 9715, 9720 POLYMERIC—These Polymeric Plasticizers impart extreme durability and weatherability to vinyl materials, yet exhibit the low-temperature characteristics and high efficiency of most monomeric plasticizers. Prolonged exposure to heat and ultraviolet light does not result in appreciable discoloration, stiffening, or sweat-out.

Expanded production facilities will triple Plasticizer production.

By mid-1953, Emery's revolutionary ozone oxidation process will greatly increase the availability of the Plastolein Plasticizers as well as exclusive Azelaic and Pelargonic Acids.

If you are not already using a Plastolein Plasticizer, start an evaluation today. Their lower costs will result in the increased use of certain of these products as basic vinyl plasticizers. Others will be very attractive as specialty plasticizers. All are noted for their low temperature properties, stability to heat and light, low water and oil extraction, low volatility, and excellent "hand" and drape.

Start an evaluation today. Write for samples . . . mail coupon for descriptive booklet.

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower Cincinnati 2, Ohio

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221 N. LaSalle St., Chicago 1, Ill.
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420 Market St., San Francisco 11, Calif.
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Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles.

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Please send me your new book on Plastolein Plasticizers. My plant compounds: ....Vinyls........Cellulosics........Synthetic Rubber

Name..............................Title..................

Company..

Address..

City..............................Zone......State..........

Specially formulated compounds can be made to provide effective seals against moisture, oils, gasoline, many solvents, heat, pressure, vacuum, weather, and vibration. In addition, compounds can be formulated to produce either cellular or solid gaskets, as well as gaskets which swell to insure hermetic sealing of an enclosed seam.

New Latex Footwear

A NEW addition to the "totes" line of latex footwear has been announced by So-Lo Marx Rubber Co., Loveland, O. Called Blizzer Boot, the new item is said to be the lightest-weight children's boot on the market, according to J. J. Marx, company president. Features of the boot include triple reinforced sole for extra wear, choice of red or amber colors, and western-cut top for ease in putting on or taking off. As with the entire "totes" line, the Blizzer Boots are made of latex and fold to handkerchief size for easy carrying in pockets or school bags. The boots will be offered in three sizes and are backed by a factory guarantee for warmth and wear.

Marsh Photographers, Inc.

Blizzer Boot Latex Boots for Children

High-Speed Aviation Tire

New Firestone Aviation Tire Passes Laboratory Tests Simulating Landing Speeds of 250 Miles an Hour

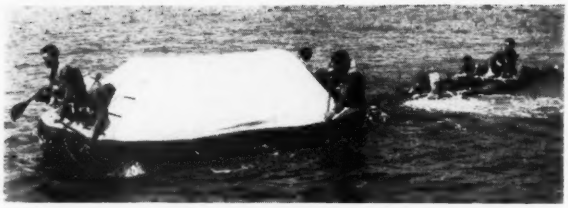
A NEW aviation tire that can hit a runway at 250 miles an hour was announced by Firestone Tire & Rubber Co., Akron, O., through Raymond C. Firestone, vice president in charge of research and production. The new tire is said to be the first of its size to meet the high-speed phase of requirements recently established by the Air Force.

The tire was developed with high-strength nylon and gum-dipped fabric construction, incorporating the design principles and compounds used in racing-car tires. One of the new tires has survived 50 simulated landings at 250 miles an hour in tests conducted by Air Force engineers.

New Rubber Lifeboat

A NEW rubber lifeboat that inflates in 30 seconds and provides 70° F. protection for 15 survivors in either arctic or tropical weather has been developed by The B. F. Goodrich Co., Akron, O., in cooperation with the Small Craft Design Section, Bureau of Ships. Comfortable temperature inside the boat is maintained by a dead air space insulation in the canopy and floor liner which holds radiant heat from the bodies of the survivors. The three-inch thick floor liner, inflated by hand pump, can be removed to permit cooling the bottom of the boat in tropical areas. The liner can also be towed as an additional life raft, if necessary.

The deflated boat, which is about the size of a small steamer trunk, can sustain the shock of a 30-foot drop from a plane or over the side of a ship. When the release cable is pulled,



Canopied Rubber Lifeboat Has Floor Liner Which Doubles as Extra Life Raft

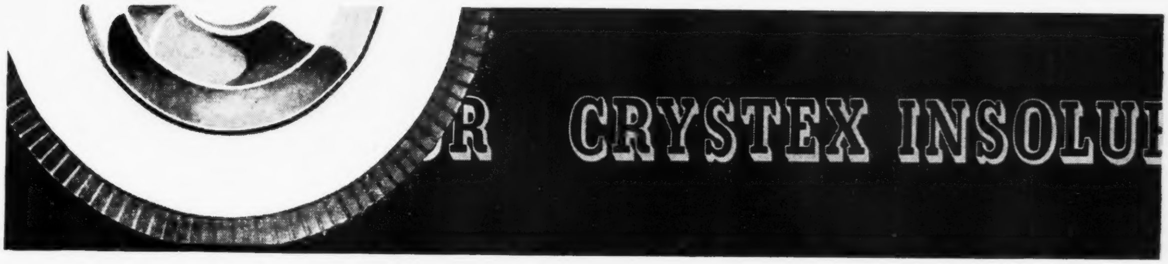
carbon dioxide gas snaps the 230-pound craft out of its carrying case, and the canopy rises into position as gas fills the arched rubber columns which support it. The lifeboat may also be thrown overboard fully inflated. Survivors use nylon boarding nets and ladders permanently attached to the craft. An automatically released sea anchor holds the boat steady during boarding. Entrance to the boat is through an aft port in the canopy. In cold regions this opening can be closed with an insulated dual wall seal; while in tropic areas a forward port can be opened to provide ventilation. Inflated, the boat is 15⅝ feet long, 7⅓ feet wide, and has 3½ feet of headroom.

Rubber and Resin Treated Paper

NEW paper products containing cork and treated with rubber or resin have been developed by the felt and fibrous products department of Armstrong Cork Co., Lancaster, Pa. Made by a patented modification of what is called the "beater-saturation" process, the materials are intended for use as improved replacements for felt or board materials and as potential substitutes for other more expensive materials.

Some of the new boards and their potential uses follow: CS-402-A, a thermoplastic material that can be embossed under heat and pressure, suggested for use in the automotive, furniture, railway car, luggage, and novelty manufacturing fields; CS-404, a material with good cushion effect that can be made in light and dark colors, applicable to the handbag and leather goods fields and as a backing for coated products; CS-405, a low priced material for use where current papers are not sufficiently strong, or where better than average water resistance is needed; CS-403, a material of high tensile strength either wet or dry, suitable for use by the leather goods trade as a plumping material; and CS-406, a tough, highly flexible material that can be shaped and formed under heat and pressure.

The new products can be made in a wide range of thicknesses and densities to meet specific requirements. All of these treated papers have high compressibility, crush resistance, imperviousness, flexibility, and uniformity, it is also claimed.



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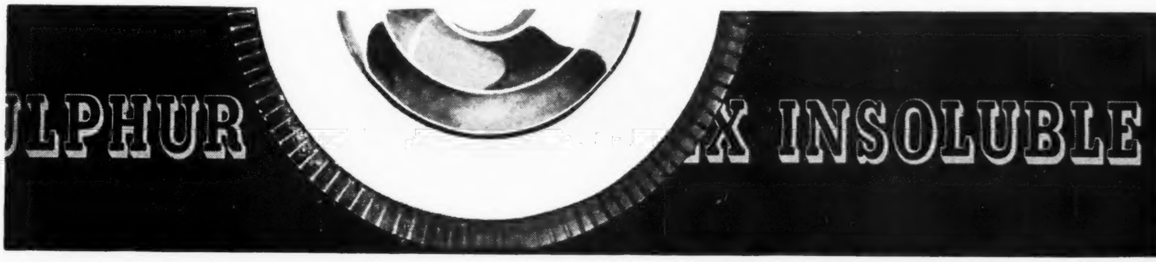

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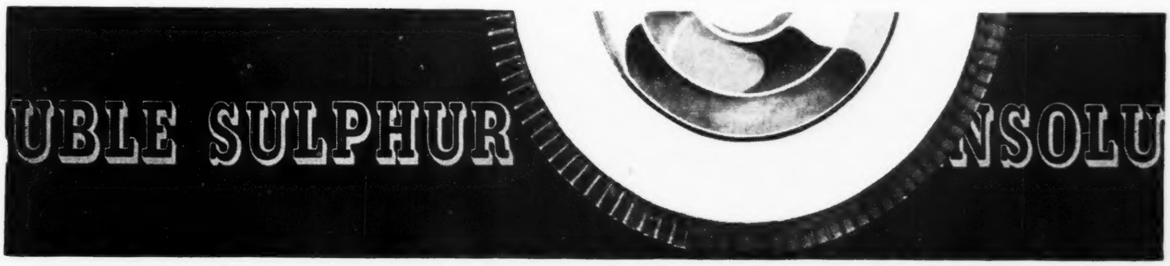

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FAR EAST

INDONESIA

Chemically Preserved Sheet

In collaboration with the Experiment Station of the C.P.V., Bogor, INIRO developed a method for protecting sheet against mold by chemical means, thus doing away with the need of smoking. Th. Schoon and J. J. Zeehuizen found that certain weak acids and their alkaline salts are particularly suitable for this purpose, especially benzoic acid and sodium benzoate. Benzoic acid not only protects against mold, but also acts as a coagulant, yielding a normal coagulum that becomes brown when dry. The drying rate is somewhat slower than when formic acid is the coagulant. On the other hand rubber prepared with benzoic acid scorches less readily than formic acid rubber; and the tensile strength of the vulcanizates at 400 to 600% elongation is somewhat higher; other physical properties are about the same as those of normal sheet.

Sodium benzoate used with latex from certain clones causes precoagulation of the yellow fraction. Light-colored sheets that can be airdried are obtainable when formic or oxalic acid is used along with the sodium benzoate; the method would therefore be suitable for use by smallholders. Cost of chemical treatment is about the same as for smoking.

The above investigators also collaborated on further work on the precoagulation of the yellow fraction of latices, by means of alkaline salts of weak acids, to obtain a higher percentage of first-quality pale crepe, a process particularly necessary in the case of certain clones like Tjirandji I and Waringiana IV. It had been found that the white fraction of the latices of such clones could be stabilized by the use of the alkaline salts of benzoic acid (also of salicylic acid); the yellow fraction then separated completely; best results were obtained when latex concentration was under 16%. The amount of yellow precoagulum obtained depended on the clone from which the latex came. The white fraction, when coagulated with sulfurous or oxalic acid, yielded a fine very pale crepe. Care had to be taken, however to remove the benzoate by washing thoroughly. The yellow fraction, after treatment with sulfurous acid or sodium bisulfite, worked up into a uniform, very yellow crepe. Inner properties of the crepes were equal to those of crepes prepared in the usual way; tensile, at 400-600% elongation, was distinctly higher; albumen content and water absorption was lower; resistance to mold greatly improved. Costs of preparation were somewhat higher.

Infrared Aging Tests

Preliminary reports of a series of investigations on rubber carried out at the INIRO (Indonesian Institute for Rubber Research), Bogor, Java, have been published in *Bergcultures*.[1]

In the first paper, K. F. Heinisch takes up infrared aging tests based on the use of the Firestone Rubberscope.[2] By means of this apparatus, it is known, the presence of copper and manganese, as reflected in the rate and temperature at which irradiated rubbers become tacky, can be determined in 10-15 minutes. Investigators at Bogor thought the device might prove equally useful in evaluating rubber coagulated with sulfuric acid and in general to check the behavior of rubber in storage. It was found that rubber coagulated with the normal amount of 2% sulfuric acid darkens and becomes tacky after 10 minutes of irradiation and under the microscope reveals an almost spongy structure due to the presence of innumerable tiny air bubbles almost invisible to the naked eye. By contrast, rubber coagulated with formic acid does not begin to darken or become tacky until treatment has continued for about 30 minutes; then it shows only a small number of air bubbles, which, however, are much larger. Dr. Heinisch points out that identification of sulfuric acid is important in connection with the deformation of bales of rubber in storage or during shipment, a problem that has become serious in the Far East in recent years. It has been found that bale deformation is much more marked and takes place much more rapidly when the rubber has been coagulated with sulfuric acid. The new method, in combination with the Institute's usual shipping test, should thus provide valuable means for checking rubber.

[1] July 16, 1952, p. 281.
[2] See India RUBBER WORLD, May, 1952, p. 257.

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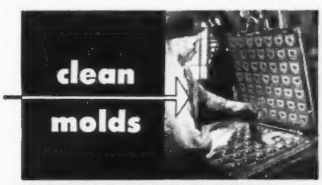

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Dialyzed Coagulum

In the usual methods of dialysis to purify rubber the starting materials are almost exclusively latex or commercial grades of raw rubber. Under the heading, dialyzed coagulum,[1] Th. Schoon gives details regarding the findings at Bogor on the dialysis of coagulum in clean water. It seems that this dialyzed coagulum yields a normal crepe rubber which has an ash content of 0.05-0.15% and albumen content of 0.10-0.15%, depending on the water used; this crepe has low water absorption; acetone solubility is not affected; aging properties under normal conditions, and also curing properties, undergo little change. On the other hand the dialyzed product is affected by temperature above 50°C. and direct sunlight; plasticity after prolonged dialyzation appears to depend on the coagulant used and on the packing density of the coagulum. After dialysis the coagulum keeps well and can be worked into crepe even after having been stored for 2-3 months. It is proposed to call the rubber from this type of coagulum CD rubber. Because it is simple to make, and cost of preparation is not much above that for ordinary crepe, it is thought that part of the native rubber product could be converted into CD rubber; smallholders could keep the usual coagulated slabs in nearby rivers, streams, or in flooded rice-fields for 2-3 weeks for dialyzation, after which the material could be collected and remilled to CD rubber by the remillers.

Further work in this direction by Th. Schoon and P. J. v. d. Linden showed that crepe made from coagulum kept under water for a relatively short time was lighter in color and dried more rapidly than normal crepe; plasticity of these crepes was practically unchanged; T. C. properties tended somewhat toward red (that is, the modulus is on the low side). The method therefore seems to have advantages for estates having enough running water and space at their disposal.

[1] *Bergcultures*, July 16, 1952.

Oxalic Acid as Coagulant

The series was concluded with a paper on oxalic acid as rubber coagulant, by Schoon and Zeehuizen. This acid had been recommended for coagulation purposes by O. deVries in 1920, but its use had hitherto been prevented by its high cost. Apparently the price is more favorable now, and INIRO in collaboration with the C.P.V. Experiment Station instituted new tests. Crepe prepared from rubber coagulated with oxalic acid has the advantage over formic acid crepe of being much lighter in color and showing little tendency to darken in storage; the use of oxalic acid would thus eliminate the usual treatment with sodium bisulfite (to bleach the crepe) and at the same time reduce drying time. For sheets, a mixture of oxalic and formic acids is preferred. Vulcanizates from oxalic acid crepe show higher tensile strength (at 600% elongation), about the same plasticity modulus and Mooney viscosity as those from normal crepe. It is expected that oxalic acid will also prove to act as antioxidant in the rubber so that the aging properties would be better than those of formic acid rubber.

MALAYA

Complaints Against Malayan Rubber

The President of the Japan Rubber Manufacturers' Association, Shojiro Ishibashi, sent a letter to E. G. Holiday, chairman of the Singapore Chamber of Commerce Rubber Association, on September 23, in which he made seven charges against Malayan rubber, as follows:

1. Malayan rubber is uneven in quality, showing wide variations in the degree of smoking often in the same shipment or bale.
2. It is often moist and mildewed owing to insufficient smoking.
3. It is usually found to be one grade lower in quality than the indicated RMA grade.
4. Shipments are carelessly packed and often contain rubbish.
5. Rubber is often adulterated.
6. Grade markings are often defaced or gone by the time bales reach Japan.
7. Weight was usually irregular and short of authorized allowance.

In his reply Mr. Holiday assured Japanese importers that the Malayan Government was anxious to maintain a high reputation


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for Malayan rubber abroad and that rubber packers sending out bad shipments would be "eliminated."

Complaints about bad rubber have been coming in from the United States and the United Kingdom as well as from Japan, but these apparently are not always considered justified. At a recent meeting of the Malacca Chamber of Commerce, President Acton announced in the course of his speech, that since the rubber packing industry today was very much at the mercy of many "frivolous claims" from London and American markets, his orgaization had proposed to the Singapore Chamber of Commerce Association the appointment of an official rubbber sampler in Malacca.

A curious side of the question is presented in the half-yearly report of the Singapore Chamber of Commerce, published late in September. American merchants are accused not only of unwillingness to cooperate with Singapore to stop inferior shipments, but actually of encouraging unreliable packers.

The *Straits Times*, September 27, quotes the report as stating: "There would be no burglaries if there were no receivers of stolen goods. Likewise there would be no bad shipments if there were no receivers of inferior qualities.

"In the case of Japan it is probable that bad shipments will be cleared up shortly as the associations there seem to be willing to cooperate with us."

Latest news from Malaya is that the Rubber Shipping & Packing Control Ordinance, which somehow has been allowed to remain inactive 2½ years, is to come into force on January 1, 1953, and that offenses are to be firmly dealt with by the new Malayan Rubber Export Registration Board. Registers will be open from the middle of November until the end of December, and by the end of the period all packers and shippers must have obtained the special certificate issued by the Board. A packer who packs his own rubber grown by himself, will pay $25 (Straits) a year for the certificate; a packer for export in the ports will pay $50, and the shipper $250 a year.

Firms in London, New York, and Tokyo are to be appointed as agents to act for the Board and report on bad shipments. In extremely serious cases a member of the Board might fly from Malaya to make direct investigations.

The Board will require every bale of rubber shipped abroad to have stenciled on it (1) the number of the packer's certificate, registered house symbol, trade mark or estate name, or the curer's licence number; (2) type of grade.

The members of the Registration Board represent various chambers of commerce, rubber traders' and planting associations, smallholders and dealers. Chaiman of the Board is Cecil Francis Smith, member of the Singapore City Council and until his recent resignation, managing director of Sime, Darby & Co., Ltd.

Effect of Lower Rubber Prices

In various sections of the country the effects of lower rubber prices are already apparent in slowdown in business in towns and of activities on estates and smallholdings with consequent dislocation of labor. Numbers of former workers in Penang remilling factories have had to find other work. Many Asian estates have reacted to the drop in prices by depressing wages below the level on European estates. In Kedah this move seems to have been widespread, and wages on small plantations are frequently very low. The "bagi dua" system of payment, by which the tapper retains half the latex he collects as his wage, has come into favor again on a number of smallholdings.

RRI Bleaching Process for White Crepe

The usual method of producing a good white crepe is to remove the naturally occurring yellow coloring material by fractional coagulation, a process that is time-consuming and moreover converts only part of the crop into first quality crepe. An alternative method has been developed at the Rubber Research Institute, Malaya[1] employing a chemical agent, such as RPA 3 and RPA 5.[2] A self-emulsifying form of RPA 3 is available as Emulsion A Concentrate, and Circular No. 35 of the Institute describes methods of bleaching crepe with it.

The chemical process, it is added, can be applied to very yellow latices not normally used for producing pale crepe and can be combined with fractional coagulation, when a whiter crepe is obtained than by the chemical process alone. Sodium bisulfite is added, as usual, in the normal amount. The importance

[1] Patent applied for.
[2] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., U.S.A.

of using only the minimum quantity of bleaching agent necessary for the desired effect is stressed, since an excessive amount of the bleach may lead to a finished crepe that is soft. Overmachining the treated coagulum and overheating the crepe at all stages of preparation are also warned against. Care is also required in handling the concentrate as contact with the skin may cause burns: the wearing of goggles is recommended when the concentrate is used.

Wage Rate Dispute

The Malayan Planting Industries and Employers' Association and the Pan-Malayan Rubber Workers' Union are again deadlocked in a wage dispute. This time the question involves fixing rates when the price of rubber is between 70 and 90 cents (Straits) a pound. At the present level of prices a cut of some sort is contemplated, which the Union opposes. The MPIEA stated recently that there probably would be no reduction in agreed standard rates after October 1, but that no prosperity payment could be made as there was no prosperity in the rubber industry at prevailing prices. Both parties have agreed to submit the matter to arbitration.

Malaya-Indonesia Talks

Malayan and Indonesian representatives who participated in the London discussions of the working party of the Rubber Study Group which started July 30, 1952, are understood to have met in an attempt to reach a compromise on their respective proposals in preparation for the conference of the working party which is to meet again in London on January 5, 1953.

At the July meeting the Malayan delegation had proposed a buffer stock; the Indonesians wanted a multi-lateral agreement like the wheat agreement combined with a buffer stock.

CEYLON

Leaf Mildew

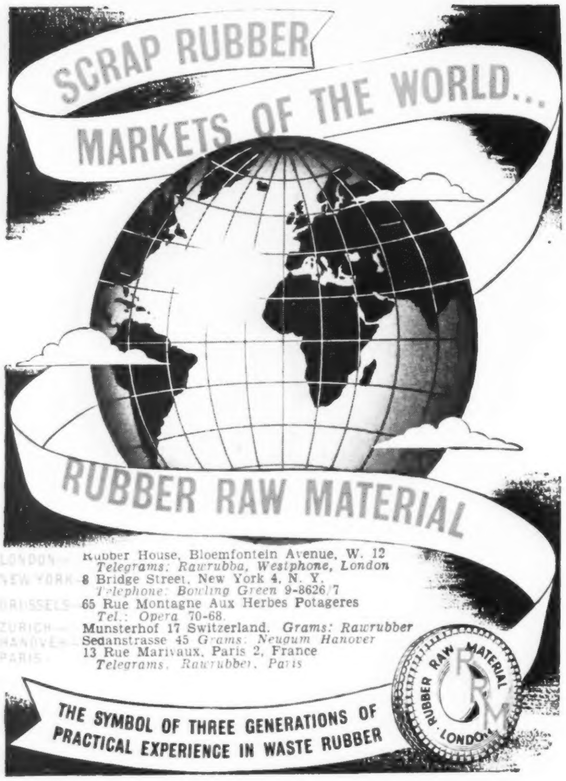
The Commission on the Rubber Industry of Ceylon, reporting in 1947, stated that *Oidium heveae*, leaf mildew of *Hevea*, was a serious menace to Ceylon's better rubber areas and had already rendered at least 110,000 acres in Ceylon uneconomic. It had caused rubber outputs to fall from 500 pounds per acre to less than 200 pounds in certain sections and was rapidly wiping out rubber at high elevations. Consequently the appointment of a mycologist to study the question was recommended, and in 1949 H. E. Young was so appointed.

In the Rubber Research Scheme of Ceylon First and Second Quarterly Circulars 1951,[1] Young reviews the work carried out so far by himself and earlier workers.

The leaf disease in question is caused by a powdery mildew fungus, *Oidium heveae*, which attacks the new leaves during refoliation, causing the smallest young leaves to fall and distorting and spotting the more mature. A single severe attack may not only reduce the annual yield by more than 20%, but will retard growth and bark renewal; repeated defoliations in one season result in branch and twig die-back which may be extended by secondary fungi entering the dead tissues, eventually even killing the trees.

The disease was first reported in Java in 1918; in 1921 it was found in Uganda; in 1925, cases appeared in Ceylon and Malaya; it was identified in Indo-China in 1929 and in the Belgian Congo in 1937. It has never been recorded on *Hevea* in Brazil so that it was clear to investigators that a fungus on some allied species in the countries named had adapted itself to the new host. In 1950, Young was able to show that *Oidium heveae* was present in the Far East before *Hevea* was introduced, and that it could have spread to *Hevea* from the weed *Euphorbia pilulifera*. Incidentally, it is pointed out that *Oidium* was first noted in Ceylon about the time when estates began to abandon the hitherto general practice of clean-weeding for the cover crop system. Young suggests the probability that the green cover crop system provided the

[1] Vol. 27, Parts 1-2, p. 6.



opportunity for the transfer of the fungus from its natural host to rubber.

Means of combating the disease were immediately tried, the most suitable of which was sulfur dusting. From the very outset, however, it was recognized that the real answer to the problem was natural resistance, and Arens, who first identified the disease in Java in 1918, was the first to suggest the selection and vegetative propagation of immune strains of *Hevea*. In 1927 a resistant tree was found in Java on the Subah estate of the then existing Government Rubber Enterprise, from which the clone LCB 870 was developed. The following year the new clone was used to make crown buddings which also proved to be resistant; however, since mildew was now being successfully fought by sulfur dusting and LCB 870 was found to be a poor yielder of latex, it ceased to be of interest in Java.

Meanwhile budwood of the new clone had been imported into Ceylon in 1940 so that LCB 870 could be included in a mildew-resistance trial together with other clones, started in 1941-42 by the Rubber Research Scheme, Ceylon, when it proved to be definitely resistant.

Young was able to show that resistance was due to the rapid development of the cuticle as compared with that of other clones (in ten days as against 18 to 22 days) so that there is only a short period during leaf growth when infection can occur; furthermore, the amount of damage is minimized when infection does occur. It is noted that the flowers and flower shoots of the clone are not resistant.

Since LCB 870 is a low yielder, top-budding of clonal seedlings with this clone has been recommended. At the same time experiments are under way to produce high-yielding *Oidium*-resistant seedlings by cross-pollination of superior clones with LCB 870. In an earlier article on this subject,[2] Young suggests that resistance to the South American leaf disease may also depend on cuticle development and that clone LCB 870 may be resistant to this disease too. So far the Far East has fortunately remained free from the South American disease, but the risk of introducing it must always be considered, he adds, and it would therefore seem to be important to test LCB 870 for resistantce in this case also, and if this test is favorable, to provide top-budded material in the East as insurance against the South American leaf disease.

In *Bergcultures*,[3] J. A. Lasschuit and J. S. Vollema review Young's findings and state that the Ceylon experience led them to turn their attention once more to the top-buddings of LCB 870 made 22 years ago on the Subah plantation. They found that, in contrast to the surrounding seedling plantation, these trees showed no signs of mildew attack in the last outbreak of the disease, thus confirming the Ceylon observations as to the immunity of LCB 870. They add that tapping results over the period December, 1932-February, 1935 (inclusive) have been found which indicate that the clone had a markedly depressing effect on the yield of the stock which appeared to extend to at least 100 centimeters from the union. The adverse effect, however, appeared to cease at 150 centimeters below the union. Consequently it was suggested that to be safe, top-budding with LCB 870 should be carried out at a height of 250 centimeters (about eight feet) in order to obtain an unaffected tapping panel of at least 100 centimeters from ground level.

[2]Rubber Research Scheme, Ceylon, Combined Quarterly Circulars for 1949, Vol. 26, Parts 1-4, p. 6.
[3]July 1, 1952, p. 257.

Rubber for the Rice of China

The shipment of rubber from Ceylon to Red China continues, at prices substantially above those ruling at Singapore. In June, the Polish freighter, *Jednosc*, with cargo space for 6,500 tons arrived at Colombo to pick up as much as possible; however, it is reported that the available supply of better grades fell far short of requirements so that Chinese buyers also bought up scrap sheet rubber and other inferior grades. Of the 4,527 tons finally shipped early in July, a good portion (about 1,000 tons, it is gathered) consisted of these lower grades; the rest of the cargo space was taken up by cotton from Pakistan.

At the end of July, prices in Ceylon shot up about 2½d a pound above world parity on the news that another ship was to call at Colombo in August to take rubber to China.

In late September, Ceylon sent about 1,500 tons of rubber to China via the Polish freighter *Kilinski*. Another Polish ship had taken 2,100 tons to this destination a few weeks earlier. The latest is the tenth shipment of rubber made by Ceylon to Communist China since the U.N. banned the exportation of rubber to Communist countries and brings to a total of 22,000 tons the amount Ceylon has thus sold.

Communist China has become Ceylon's best customer for

rubber and is likely to become the only one if negotiations for a rubber-rice agreement between the two countries are successful. A six-man mission, headed by the Minister of Trade & Commerce set out for Peking in the beginning of September when it was announced that Ceylon was prepared to sell its entire output of rubber to China in return for much-needed rice.

News from Colombo dated October 3, states that Chinese buyers recently reduced their rubber purchases from Ceylon; they canceled an order for 4,000 tons of sheet rubber. It is believed that the Chinese are holding off pending results of the trade agreement discussions.

THAILAND

The rubber industry of Thailand labors under two serious handicaps—low productivity of plantations and poor quality of the rubber prepared here. Indeed the greater part of Thailand rubber is of such poor quality as to be classed as Grade 3 and lower (RMA) and, hence, must be sold at uneconomic prices to undiscriminating buyers. Now ambitious plans are afoot to set the industry here on a sound basis and make the Thailand product competitive with that of the chief rubber producers.

These plans are to be made possible by the aid of funds from the United States and technical guidance and assistance from a rubber expert, William Lloyd, loaned by the FOA (Food & Agriculture Organization). The plans envisage a short-term program of improving handling and processing by the installation of modern equipment and techniques, and a long-term project involving the gradual replacement of present low-yielding trees with known high-grade types. To further the latter part of the scheme the Rubber Division of the Ministry of Agriculture is establishing multiplication nurseries and is importing new varieties.

As to the first part of the plan, a model processing plant is to be established at Kohone Experiment Station near Hadyai, the rubber producing center of South Thailand. To this plant co-operative factories would bring their product for sorting, grading, and packing. The newly created Thailand Ministry for Cooperatives has already set up five factories for processing raw rubber for export. The 1952 plans of the Ministry provide for the establishment of six more factories with modern equipment. Of these, three will have a capacity of up to 1,800 kilos daily and three smaller ones, up to 800 kilos daily. At the model processing plant the graded rubber would be stamped and certified, and in time the stamp would be recognized on the world market.

It seems that it is the intention eventually to produce sole crepe, liquid latex, and powdered rubber; improvement of tires made at a government pilot-plant now in operation will be encouraged.

Letter to the Editor

(*Continued from page 222*)

Migration is a property of the system, and to attribute it wholly to the plasticizer can be misleading. Mr. Geenty correctly points out that petrol extraction is not a test for migration (it is, however, a very good test for petrol-resistance). Similarly, migration into the silica powders carefully selected for maximum activity by Mr. Geenty is not necessarily a guide to the behaviour of a plasticizer in normal service conditions.

Mr. Geenty has demonstrated that a polyester plasticizer can migrate out of a vinyl film into silica powder. This does not affect the experimental fact that polyester plasticizers migrate from vinyl compounds into other service-encountered substances at a far lower rate than low-molecular-weight plasticizers do, if at all.

Yours faithfully,

For The GEIGY COMPANY, LTD.

I. WILLIAMSON

Plastics Division (Tech.), Physical Lab.,

Tenax Rd., Trafford Park, Manchester 17, England.

Editor's Book Table

BOOK REVIEWS

"The Measurement and Control of Temperatures in Industry." R. Royds. Chemical Publishing Co., 212 Fifth Ave., New York 10, N. Y. Cloth, 5½ by 8½ inches, 266 pages. Price, $5.

The latest developments in industrial temperature measurement and control are discussed in detail in this volume by an English author. The different methods and equipment for measuring temperatures are described and compared, and emphasis is placed on standardization and automatic control of temperatures in industry. The use of 116 illustrations as well as numerous tables and calculations clarify the text and point up the need of proper temperature measurement and control in improving product quality, increasing production, and saving fuel and labor.

The book is divided into eight chapters covering standard temperature scales; expansion thermometers; electrical thermometers and pyrometers; total radiation, optical, and photoelectric pyrometers; galvanometers as temperature indicators, recorders, and controllers; other types of pyrometers; the mean temperature of a metal wall; and the measurement of rapidly fluctuating temperatures. Appendices cover the international temperature scale and the comparison of thermometric scales, and there is a subject index.

"Chemical Engineering Operations." Frank Rumford. Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. Cloth, 5½ by 8½ inches, 382 pages. Price, $7.50

Designed as an introductory text, this book, also apparently by an English author, gives a clear picture of the basic principles involved in the operation of chemical plants. Emphasis is on the processes peculiar to chemical plants rather than on standard plant engineering. For this reason power generation and transmission and refrigeration are not discussed. The theoretical aspects of chemical plant procedures are covered, together with their mathematical foundations. Considerable space is devoted to practical phases, including evaluations of the processes and equipment from the standpoints of efficiency and economy. Of special interest is the use of many illustrative examples for each operation discussed, including the calculation of results and their graphical presentation.

The 17 chapters cover chemical works pumping; heat transfer; distillation; gas absorption; extraction; evaporation; drying; mixing; crystallization; liquid filtration; centrifugal practice; gas cleaning; size reduction; screening, classification, and sedimentation; solid separation; measurement; and automatic control. An adequate subject index is appended.

NEW PUBLICATIONS

"R. D. Wood Co. Since 1803." R. D. Wood Co., Independence Square, Philadelphia 5, Pa. 32 pages. This handsome illustrated bulletin reviews the extent of the company's operations in the manufacture of presses and other hydraulic equipment. Personnel covered include engineers, patternmakers, foundrymen, machinists, and men in assembly, testing, and shipping operations.

"Styron 700." Dow Chemical Co., Midland, Mich. Information is given on the properties, fabricating, finishing, and suggested uses for Styron 700, a new addition to the company's line of polystyrenes. The new material, when properly molded, can withstand temperatures to 220° F., as compared with 200° F. for standard polystyrenes.

"Laboratory Report." Vol. I, No. 1, September, 1952. Franklin Institute Laboratories for Research & Development, Philadelphia 3, Pa. 4 pages. This is the first issue of a new quarterly newsletter describing recent developments and other activities in the Laboratories.

"**Calco Rubber Chem Lines.**" Vol. 1, No. 2, September, 1952. Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J. 4 pages. This second issue of "Chem Lines" describes the RMA seminars on crude rubber quality; MBTS dustless accelerator; and the use of Antioxidant 2246 and Pepton 22 in masticating cold GR-S polymers without development of high temperatures and detrimental gel.

"**Bibliography of Rubber Literature for 1944 and 1945.**" Division of Rubber Chemistry, American Chemical Society. Division treasurer—A. W. Oakleaf, Phillips Chemical Co., 605 Evans Bldg., Akron 8, O. Cloth, 6 by 9 inches, 415 text pages. Price to non-members, $5 This seventh edition of the "Bibliography" brings the total coverage of the series to the period 1935-1945. The new book continues the growth in size noted in the previous edition, being some 100 pages larger. The current edition contains 4903 specific references to patents and literature, as compared with 3,856 references in the 1942-1943 edition. The general format remains the same; the references are classified into 123 groups, and brief abstracts appear for most references. There are also comprehensive author and subject indices. The value of this work to all technical men in the rubber field requires no elaboration.

"**Goodyear Tires, Batteries, Accessories Manual.**" 1952 Revised. Goodyear Tire & Rubber Co., Inc., Akron, O. 46 pages. This new edition of the "Manual" combines complete specifications and parts numbers for the company's major auto accessory lines, including tires, batteries, cables, hose, belts, mats, fuses, gas caps, bulbs, oil filters, mufflers, tail pipes, radiator caps, seat covers, shock absorbers, spark plugs, thermostats, tire chains, and windshield wipers.

"**GR-S Code Number Revisions and Replacements.**" Phillips Chemical Co., Philblack Sales Division, 605 Evans Bldg., Akron 8, O. This chart tabulates experimental and standard GR-S polymers and masterbatches, showing both old and new nomenclature adopted by RFC on July 1. Masterbatches are also tabulated according to code number, and information appears on compositions, stabilizers, type and quantity of black, and type and quantity of oil.

"**Safe Working on Horizontal Two-Roll Mills.**" National Joint Industrial Council for the Rubber Manufacturing Industry, 236 Royal Exchange, Cross St., Manchester 2, England. 108 pages. This report discusses the work and recommendations of a program on prevention of mill roll nip accidents carried on by the Council's accident prevention committee and an advisory committee of industrial engineers. The necessary features for safe working are given as follows: (1) in normal working the operator must not be able to reach beyond the safety limit (the point beyond which the mill rolls cannot be stopped in time to prevent nip accidents); and (2) when the operator's hand reaches or passes the safety limit, the mill must be stopped without voluntary action on his part. Both theoretical and practical discussions of the problem are given, together with a glossary of terms and a bibliography of literature references.

"**Armstrong's Epoxy Resin Adhesives.**" Armstrong Products Co., Warsaw, Ind. 4 pages. This bulletin gives the properties of the company's five epoxy resin adhesives, methods of application, and applications, including use for permanent mounting of Baldwin SR-4 strain gages.

"**Chronological List of Technical Papers Relating to the Government Synthetic Rubber Program.**" Compilation DRP-4. Research & Development Division, Office of Synthetic Rubber, Reconstruction Finance Corp., 811 Vermont Ave., N.W., Washington 25, D. C. 66 pages. This compilation gives a chronological listing of published papers dealing with work supported by RFC. The listing is by company or organization, and each paper is shown by title, author, publication, and date of publication. A separate 16-page author index for this compilation is also available.

"**The Metrogram, New High Capacity Precision Weighing Instrument.**" Arthur S. LaPine Co., Chicago, Ill. 4 pages. The company's Metrogram scales are described and illustrated. Made in both electronic and mechanical models, these scales feature capacities to 110 pounds, sensitivities from ±10 milligrams, and accurate weighing in out-of-level positions.

"Vulcan 9." Technical Report No. R-10. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 7 pages. Data appear on Vulcan 9, a new SAF black, in comparison with Cabot's two HAF blacks, Vulcans 3 and 6, in addition to properties of the blacks themselves, test data are given on their effect in GR-S cold rubber and natural rubber vulcanizates. Vulcan 9 is shown to impart higher abrasion resistance and tensile strength than the HAF blacks.

"The Vanderbilt News." Vol. 18, No. 5, September-October, 1952. R. T. Vanderbilt Co., 230 Park Ave., New York 17, N. Y. 22 pages. This issue of the "News" is devoted to information and test data on vulcanization of GR-S and natural rubber. Topics covered include factors affecting vulcanization rate; judging the degree of vulcanization in thick sections; and effects of loading on vulcanization rates in thick sections.

"Annual Report 1951, National Bureau of Standards." NBS Miscellaneous Publication 204. 109 pages. For sale by the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Price, 50¢. The report summarizes the scientific investigations conducted by the Bureau during the fiscal year 1951. Of interest is the work by the organic and fibrous materials division on polystyrene degradation, analytical methods for rubber, and synthetic rubber tires.

"Tygon Corrosion Resistant Linings." U. S. Stoneware Co., Akron, O. 16 pages. The history of Tygon as a lining and covering material is covered in this illustrated bulletin. Information includes composition, forms, properties, application methods, chemical resistance, maintenance and repair, and comparison with other lining materials.

"Indestructible Plastic Products." New York Belting & Packing Co., Passaic, N. J. 8 pages. This bulletin describes the company's Indestructible plastic, a tough thermoplastic material with superior chemical resistance available in the form of industrial moldings, extrusions, and fabrications. Standard items include pipe and fittings, tanks, fume ducts, and cutting boards.

"IMS Injection Machine Nozzles for All Injection Machines." 1953 Edition. Injection Molders Supply Co., Cleveland, O. 34 pages. This current catalog illustrates, describes, and gives dimensional data on the company's line of nozzles for injection machines.

"1953 Guide to Improved Packaging with Bakelite and Vinylite Plastics and Resins." Bakelite Co., New York, N. Y. 12 pages. Latest developments in packaging for a wide variety of products are described and illustrated in this booklet. Applications are grouped according to type of plastic packaging.

Publications of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

"B-L-E, an Antioxidant for Developing, Superaging and Flexing Resistance." Compounding Research Report No. 19. 10 pages. Laboratory formulations and test data are presented on the use of B-L-E as an antioxidant in natural rubber auto and truck tread stocks, natural rubber-GR-S-reclaim tire carcass stocks, and Paracril B and Neoprene Type W molded stocks. Information is also provided on the use of B-L-E as a stabilizer for GR-S polymers, and as a latex antioxidant.

"Paracril Nitrile Rubbers—Specification Compounds and General Compounding Recommendations." Technical Bulletin No. 3. 37 pages. Comprehensive information on the formulation, compounding, and properties of Paracril stocks to meet ASTM D735-52T., MIL-R-6855, MIL-900A, and AMS-3204B appear in this bulletin. Miscellaneous oil resistant stocks are also described.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. **"Neoprene Latex Foam."** Report No. 52-2. R. N. Conklin and J. C. Carl. 51 pages. The comprehensive report covers the properties of neoprene foam products in comparison with other types of foams. Formulations and processing methods are given for both slab and molded products. A list of patents on elastomeric foam is included.

"RPA No. 3 in Oil Extended GR-S Type Copolymers." BL-248. 4 pages. Information appears on the effect of RPA No. 3 on improving the mixing and extrusion, and lowering the processing temperatures of GR-S X-628 and Polygen.

Publications of the British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Herts., England.

No. 157. **"Quantitative Characterization of Cure. Part I.** Relationship between Modulus and Strain in Pure Gum Natural Rubber Vulcanizates." R. F. Blackwell. **"Part II.** Use of Modulus as a Measure of the State of Cure in Pure Gum Natural Rubber Vulcanizates." W. P. Fletcher, Geoffrey Gee, S. H. Morrell. **"Part III.** Relation between Compound Viscosity and Vulcanizate Stiffness in Pure Gum Natural Rubber Vulcanizates." R. F. Blackwell, W. P. Fletcher, Geoffrey Gee. **"Part IV.** Definition and Measurement of Rate of Cure for Gum Natural Rubber Compounds." Geoffrey Gee and S. H. Morrell. 44 pages. The first paper shows that the relationship between strain and modulus is sufficiently close for one to be calculated from the other. The second paper reveals that the modulus of a vulcanizate at 100% elongation can be used as a quantitative measure of the state of cure. The third paper deals with the effect of viscosity on the modulus, and the fourth paper sets forth a tentative method of evaluating rate of cure from modulus measurements.

No. 158. **"The Free Energy of Deformation for Vulcanized Rubber."** R. S. Rivlin and D. W. Saunders. 7 pages. Results are given of load-deformation measurements on natural vulcanizates in a range of hardnesses The free energy of deformation is shown to depend on the strain invariants.

No. 159. **"The Aggregation of Oil Particles in Emulsions."** E. G. Cockbain. 12 pages. Studies are reported on reversible aggregation and disaggregation of oil particles in soap stabilized emulsions, using rate of creaming as the chief criterion of aggregation.

No. 160. **"Geraniolenes. The Decomposition of 2,6-Dimethylhept-5-en-2-ol and Some Derivatives Thereof."** L. Bateman, J. I. Cunneen, E. S. Waight. 4 pages. Mixtures obtained by dehydration of 2,6-dimethylhept-5-en-2-ol, and by decarboxylation of geranic acid are analyzed.

No. 161. **"Large Elastic Deformations of Isotropic Materials.** IX. The Deformation of Thin Shells." J. E. Adkins and R. S. Rivlin. 27 pages. The inflation of a circular diaphragm of an incompressible isotropic material is studied in detail. The problem of inflation of a spherical balloon is also discussed.

No. 162. **"The Molecular Complexity of Sulfur in the Liquid and Vapor."** Geoffrey Gee. 12 pages. Previous data are reexamined to give new estimates of the molecular complexity of liquid sulfur.

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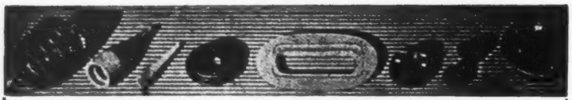

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MARKET REVIEWS

RUBBER

SPORADIC activity and relatively steady prices featured the natural rubber market during the period from September 16 to October 15. Offerings were said to be plentiful on the spot market, but factory buying interest was concentrated on the lower grades of rubber. As a result, prices for the lower grades rose during the period; while the better smoked sheet and latex crepe grades showed a small price decline.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	July 26	Aug. 30	Sept. 20	Sept. 27	Oct. 4	Oct. 11
R.S.S.: #1	30.75	28.00	28.25	28.50	28.00	28.00
2	30.25	27.50	27.50	27.75	27.25	26.00
3	29.25	26.50	26.75	27.00	26.50	25.00
Latex Crepe:						
#1 Thick	39.25	38.50	38.00	38.50	37.75	37.00
Thin	39.25	38.50	38.00	38.50	37.75	37.00
3 Amber Blankets	24.75	24.25	24.00	24.50	24.25	23.50
Thin Brown Crepe	21.75	22.50	22.00	23.00	23.00	23.50
Flat Bark	18.25	19.00	19.50	19.75	19.75	20.25

The spot price for #1 Ribbed Smoked Sheets started the period at 28.25¢, rose to 28.50¢ on September 22, and on September 29 dropped back to 28.00¢, at which level it remained throughout the balance of the period. Lack of buying interest in the better grades was reflected by the absence of day-to-day price fluctuations. Over the course of the period, #3 Thin Brown Crepe rose from 22.00¢ to 22.50¢; while Flat Bark prices marked up a gain from 19.50¢ to 20.50¢.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures	July 26	Aug. 30	Sept. 20	Sept. 27	Oct. 4	Oct. 11
Dec.	28.20	27.00	26.50	26.50	26.75	26.25
Mar.	27.30	26.00	25.35	25.15	25.00	25.00
May	26.75	25.65	25.10	24.85	24.60	24.70
July	26.35	25.40	24.80	24.60	24.55	24.30
Sept.	....	25.20	24.80	24.60	24.45	24.15
Total weekly sales, tons	2,080	3,750	1,040	1,460	910	1,720

Trading in rubber futures on the Commodity Exchange was generally light. There were brief flurries of activity reflecting the trading in the spot market, but most activity was confined to hedging as prices dropped downward irregularly. December futures began the period at 26.80¢, reached a high of 27.00¢ on September 22, fell to a low of 26.10¢ on October 14, and closed the period at 26.20¢. Only 3,010 tons were sold during the second half of September, making the total for the month only 10,091 tons. An even duller market during the first half of October saw a total of just 2,240 tons sold.

Latex

THE *Hevea* latex supply situation continued tight during the period from September 16 to October 15. It had been hoped that the shortage might be relieved in December, but because of heavy rains in Malaya and strikes and civil unrest in Sumatra, it now appears that the tight market will persist until January. November delivery prices for bulk lots of *Hevea* latex were nominal since no physical latex is available for this position. By the end of the period, December supplies became scarce and were quoted at 37¢ a pound dry solids. Latex for 1953 delivery is now priced at approximately 34¢ for bulk lots.

Final July and preliminary August domestic statistics on *Hevea* and synthetic rubber latices are given in the following table:

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Consumption	Stocks
Natural latex:				
July	0	3,121	3,211	8,521
Prelim. Aug.	0	4,684	4,399	9,033
GR-S latices:				
July	2,593	200	2,535	4,282
Prelim. Aug.	3,129	302	3,102	4,501
Neoprene latex:				
July	564	0	504	1,095
Prelim. Aug.	643	0	640	969
Nitrile latices:				
July	316	0	216	601
Prelim. Aug.	414	0	267	473

Prices for GR-S latices range from 21.5-26.0¢ a pound dry solids. There were no changes in neoprene and nitrile rubbber latex prices during the period.

RECLAIMED RUBBER

THE improved demand for reclaimed rubber noted during the preceding month continued during the period from September 16 to October 15. Demand during September was said to be about 10% above the August level, and October is expected to be equal to or better than September. Reclaim inventories in the hands of rubber manufacturers are said to be down to near normal levels, requiring that purchases be made to keep pace with current production of rubber goods. In particular, tire, battery box, and tape reclaims have shown a definite improvement in demand that is expected to continue in the immediate future.

Final July and preliminary August statistics on the domestic reclaimed rubber industry are now available. July figures are: production, 16,213 long tons; imports, 125 long tons; consumption, 18,354 long tons; exports 735 long tons; and month-end stocks, 36,287 log tons. Preliminary August figures, in long tons, follow: production, 17,254; imports, 113; consumption, 20,447; exports, 819; and month-end stocks, 31,931.

No changes were made in reclaim prices during the period, and current prices per pound, for the more active grades follow:

Reclaimed Rubber Prices

Whole tire: first line	$0.10
Fourth line	.0875
Inner tube: black	.15
Red	.22
Butyl	.125
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

SCRAP RUBBER

THERE was some signs of improvement in the scrap rubber market during the period from September 16 to October 15, reflecting the improvement in demand for reclaimed rubber. By the end of the period all of the reclaiming mills had entered the scrap market although their purchases were still on a limited scale. It was reported, however, that mill orders were being placed on a monthly basis, rather than just to meet immediate requirements. Trade observers state that business in both scrap tires and tubes will have to improve considerably before it can be termed normal.

At the beginning of October it was reported that reclaimers are specifying that shipments of mixed tires to them contain a minimum of 30% truck and bus casings. Scrap dealers state that this requirement is impractical, and the imposition of a reclaimers' penalty, which may run as high as $2 a ton, will only aggravate the situation. Scrap dealers report that they have very large inventories of auto tires and very low stocks of truck and bus tires. Because of the high cost of new truck and bus tires, all casings suitable for vulcanizing, repair, or recapping are being utilized by truck and bus operators, and supplies to the scrap trade are very limited. Dealers say that scrap truck and bus tire accumulations from collectors average at about 5% of total rubber scrap. In addition, only scrap dealers engaged solely with rubber are segregating these tires. The net effect of the requirement, scrap dealers insist, is to cause further hardship for their trade.

Scrap rubber prices showed no changes during the period, although the tube market was reported to be firm. Following are dealers' selling prices for scrap rubber in carload lots, delivered to mills at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$9.00	$12.00
S. A. G. auto tires	Nom.	Nom.
Truck tires	Nom.	12.00/ 13.00
Peelings, No. 1	Nom.	42.50/ 45.50
2	Nom.	23.00
3	Nom.	20.00
	(¢ per Lb.)	
Auto tubes, mixed	2.75/ 3.00	2.75/ 3.00
Black	3.00	3.75
Red	7.25/ 7.75	7.25/ 7.75
Butyl	1.75/ 2.00	1.75/ 2.00

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

Futures	July 26	Aug. 30	Sept. 20	Sept. 27	Oct. 4	Oct. 11
Dec.	36.70	38.84	38.88	38.82	38.73	37.52
Mar.	36.62	38.72	38.85	38.81	38.80	37.59
May	36.45	38.54	38.62	38.68	38.70	37.52
July	36.04	38.00	38.10	38.15	38.25	37.13
Oct.	34.59	36.05	35.74	35.93	35.85	35.30
Dec.	34.38	35.83	35.60	35.79	35.69	35.21

A DOWNWARD price trend was evident on the New York Cotton Exchange during the period from September 16 to October 15. During the early part

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RUBBER TECHNOLOGIST—CHEMIST OR CHEMICAL ENgineer. Large eastern supplier has opening for permanent position in its rubber laboratory for recent college graduate with up to five years' industrial experience in mechanical goods, sundries, wire, tires, or latex. Practical experience in factory processing and compounding essential so that laboratory results can be readily interpreted and demonstrated to customers. Position offers excellent opportunities for advancement in either sales or development compounding. Progressive management encourages publication of experimental work. This, coupled with laboratory having finest equipment and staffed with highest type of trained technicians, assures successful applicant of ample opportunity to demonstrate ingenuity and ability. Position also offers opportunity for some travel and for contacts with the rubber industry. Write, giving in full detail, age, education, and experience. Replies held strictly confidential. Our employes know of this ad. Address Box No. 1173, care of INDIA RUBBER WORLD.

WANTED: SUPERINTENDENT FOR BANBURY AND MILL DEpartment, with experience to take full responsibility in Los Angeles plant. Excellent opportunity. Write giving full particulars and references. Address Box No. 1174, care of INDIA RUBBER WORLD.

INSULATED WIRE PLANT LOCATED IN NEW ENGLAND requires extruding room foreman. Must be thoroughly experienced on CV machines jacketing flexible cords. Address Box No. 1175, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST—TECHNICAL SALES SERVICE. Large Eastern chemical manufacturer has technical sales service opening in synthetic rubber and rubber chemicals. Age 25 to 35. Several years' experience in rubber manufacture. College degree. Foreign languages, preferably German and French. Should be willing to make headquarters in Europe. Excellent opportunity in rapidly expanding field. Write giving in full detail age, education, and experience. Replies held strictly confidential. Our employes know of this ad. Address Box No. 1176, care of INDIA RUBBER WORLD.

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RUBBER CHEMIST—NEW ENGLAND MANUFACTURER OF rubber footwear has an opening for a rubber chemist, experienced in development and manufacturing. Must have complete knowledge of formulating compounds, factory processing, and laboratory control. Write giving detailed résumé, salary expected. Our staff has knowledge of this ad. Address Box No. 1177, care of INDIA RUBBER WORLD.

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FOR SALE: 1—BALL & JEWELL NO. 1½ ROTARY CUTTER, stainless steel. 3 Mikro pulverizers #1-SH, #2-SI, #2-TH. 2 Kux rotary pellet presses. 6 Stokes rotary pellet presses. Read 600-gal. jacketed ribbon mixer. Large stock stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1424 N. 6th St., Philadelphia 22, Pa.

FOR SALE: NEW LABORATORY MILLS AND CALENDERS, also used Banbury Mixers, Mills, Calenders, Extruders, Tubers, Hydraulic Presses, Vulcanizers. Send us your inquiries. EAGLE INDUSTRIES, INC., 112 Washington Street, New York 6, N. Y. DIgby 4-8364.

1—ADAMSON VULCANIZER, 6' X 20', WITH QUICK-OPENING door, 7/16" steel shell, designed pressure 100 p.s.i., tested pressure 200 p.s.i. Address Box No. 1180, care of INDIA RUBBER WORLD.

of this period prices fluctuated irregularly, but on October 8 a sharp decline set in folowing release of the government's latest crop estimate. This estimate of 14,413,000 bales (of 500 pounds each) was well above trade expectations and touched off a wave of liquidations and hedgings that sent prices down. This estimate also allayed concern over a possible tight cotton supply situation developing later in the season. The sharp price drop brought reports toward the end of the period that producers might resort to holding back their cotton, but traders tended to discount this rumor in view of heavy spot sales in the southern markets.

The 15/16-inch middling spot price began the period at 39.60¢, rose a to high of 39.85¢ on September 22, was quoted at 39.20¢ on October 7, and ended at a low of 37.45¢ on October 15. Futures prices showed similar movement, and closing quotations on October 15 were 37.12¢ for December and 37.29¢ for March.

Fabrics

Firm prices despite a lack of demand for all types of gray goods constructions characterized the cotton fabrics market during the period from September 16 to October 15. Lightweight wide industrial goods were in greatest demand, with wide sheetings being particularly sought after for spot and fourth-quarter deliveries. Most ducks were sold out into the fourth quarter, while wide drills were sold into the first quarter of 1953. Trading in wide sateens was somewhat slower, but many constructions were sold for fourth-quarter delivery. Osnaburgs and hose and belting ducks were reported to be quite slow.

Mill statistics for hose and belting ducks show that production during the first six months of this year totaled only 8,653,000 yards, as compared with 12,650,000 yards during the first half of 1951. Since mills are still operating on a reduced schedule, total production of hose and belting ducks for the year will probably be about 17,000,000 yards, as compared with 22,000,000 yards last year and 19,000,000 yards in 1950. Purchasing of hose and belting ducks from mills is reported to be on a month-to-month basis; early in October few sales were made for November delivery. In a normal market these ducks are sold three or more months ahead.

Cotton Fabrics

Drills			
59-inch 1.85-yd. . . . . *yd.*	$0.39	/	$0.40
2.25-yd.	.35	/	.36
Ducks			
38-inch 1.78-yd S. F. . . . . *yd.*	.3675		
2.00-yd D. F.	.33		
51.5-inch, 1.35-yd, S. F.	.5325		
Hose and belting	.73		
Osnaburgs			
40-inch 2.11-yd. . . . . *yd.*	.25		
3.65-yd	.16		
Raincoat Fabrics			
Print cloth, 38½-inch, 64x60 *yd.*	.1625	/	.165
Sheeting, 48-inch, 4.17-yd	.22⅜	/	.225
52-inch 3.85-yd	.245		
Chafer Fabrics			
14-oz./sq. yd. Pl. . . . . *lb.*	$0.79		
11.65-oz./sq. yd. S	.71		
10.80-oz./sq. yd. S	.73		
8.9-oz./sq. yd. S	.765		
Other Fabrics			
Headlining, 68-inch 1.35-yd., 2-ply . . . . . . *yd.*	nom.		
68-inch, 1.25-yd. 2-ply	.67		
Sateens, 53-inch 1.32-yd	.60	/	.61
58-inch 1.21-yd	.655	/	.66
Tire Cords			
K. P. std., 12-4-2 . . . . *lb.*	.85		

RAYON

TOTAL shipments of all types of rayon and acetate by domestic producers during September amounted to 108,900,000 pounds, a decrease of 4.5% from the August figure. Of this total, 34,400,000 pounds were of viscose high-tenacity yarn. September shipments of high-tenacity yarn were unchanged from the previous month, and end-of-September stocks totaled 5,300,000 pounds. Calculated production of viscose high-tenacity yarn during September was 34,000,000 pounds, or 96% of rated capacity. Third-quarter figures for this yarn were as follows: calculated production, 106,000,000 pounds; and shipments, 104,800,000 pounds.

Tire cord and fabric production during the second quarter of this year totaled 129,000,000 pounds, of which 29,000,000 pounds were of cotton, 99,000,000 pounds were of rayon, and 1,000,000 pounds were of nylon. In addition, 11,000,000 pounds of cotton chafer fabric also were produced during this period. Of particular interest is the fact that this quarter represented the first time that rayon plus nylon tire cord and fabric production reached the 100,000,000-pound level.

No changes occurred in rayon tire yarn and fabric prices during the period from September 16 to October 15, and current prices follow:

Rayon Prices

Tire Yarns			
1100/ 480			$0.63
1100/ 490			.62
1150/ 490			.62
1650/ 720			.62
1650/ 980			.61
1900/ 980			.61
2200/ 960			.61
2200/ 980			.60
4400/2934			.63
Tire Fabrics			
1100/490/2			.72
1650/980/2	$0.659	/	.73
2200/980/2			.685

Washington Group

(*Continued from page 239*)

consultant; editor of the Group's publication, *Capitol Cues*, Mr. Scanlan; and publicity, Rachel F. Fanning, Bureau of Standards.

Philip Stockvis, United States Department of Commerce, was chairman of the banquet committee and was assisted by George Steiner, William Blake, W. M. Lingley, Richard Harmon, and Aden Miller.

Szegvari and Fisher Speak before New York Group

THE fall meeting of the New York Rubber Group took place on October 24 at the Henry Hudson Hotel, New York, N. Y. The program included an afternoon technical session, annual business meeting and election of officers, cocktail hour, and dinner, followed by an entertainment program of vaudeville acts. Approximately 150 members and guests were present at the technical session and meeting; while 228 attended the dinner, both of which were presided over by J. S. Corrigal, R. T. Vanderbilt & Co., chairman of the Group.

Two talks were featured at the technical session: "Fine Grinding of Latex Dispersions," by A. Szegvari, Union Process Co.; and "Latest Developments in Synthetic Elastomers," by Harry L. Fisher, Office of Synthetic Rubber, RFC.

According to Dr. Szegvari, dispersions used in latex compounds have to be much finer than usual commercial dispersions; otherwise they are not incorporated properly in most deposition processes. Trouble-free work in latex plant is based on best dispersions with finest particle size. One requires finer subdivision of pigments in latex methods than in mill mixing of rubber.

The most important ingredients in latex compounding, declared the speaker, are the solids, which are ground or "dispersed" in pebble mill-type equipment or attritors. Liquid ingredients are best processed in colloid mills, and the resilient materials, like reclaim, in internal mixers.

The attritors, the newest fine grinding equipment, grind, according to available production records, eight to ten times faster than conventional mills. They have a stationary grinding tank; the charge to be ground, together with very small grinding stones, are kept in continuous interaction by a specially designed agitator. A cooling jacket provides temperature control during the grinding. A permanent access to the grind can be inspected any time, and corrections made whenever necessary. The attritors have very low power consumption and occupy little floor-space, Dr. Szegvari further explained.

Satisfactory dispersion processing requires both well-engineered equipment and also good chemical formulation. One should insure compatibility of all ingredients, in particular dispersing of agents, and all processing steps, which is much more important for latex processing than with conventional mill mixing of rubber goods.

Dr. Fisher's talk, which will be published in a future issue of India RUBBER WORLD, was a literature review of developments in synthetic elastomers during the past year. Topics covered included cold GR-S, oil-extended GR-S, nitrazole copolymer, other butadiene copolymers, redox systems, low-temperature polymers, reinforcing materials, tread wear, ozone testing, latex, adhesives, sodium elastomers, alfin polymers, Hycar, neoprene, butyl, silicone rubber, polyacrylic rubber, Hypalon S-2 and the German Vulcollans.

An added feature of the technical session was a brief illustrated talk by C. L. Christensen, Dow Corning Corp., on his company's silicone exposition. Members who have not as yet seen the exposition were invited to attend either in Buffalo, N. Y., during the A. C. S. Rubber Division meeting, or in Newark, N. J., on November 4-7.

Highlighting the business session was the annual election of officers; the members adopted the slate of candidates presented by the nominating committee This committee consisted of S. M. Martin, Jr., Thiokol Corp., chairman; A. H. Eufer, R. T. Vanderbilt Co., Inc.; T. N. Loser, Georgia Marble Co.; and M. R. Buffington, Lea Fabrics, Inc. The new officers for the coming year are as follows: chairman, George N. Vacca, Bell Telephone Laboratories; vice chairman, Joseph Breckley, Titanium Pigment Corp.; secretary-treasurer, B. B. Wilson, India RUBBER WORLD; and sergeant-at-arms, R. R. Sterrett, Naugatuck Chemical Division, United States Rubber Co. Newly elected to the Group's executive committee for three-year terms were E. W. Caton, Pawling Rubber Co.; C. O. Davidson, Binney &

CLASSIFIED ADVERTISEMENTS

MACHINERY AND SUPPLIES FOR SALE (Continued)

SPECIAL OFFERINGS

1—22 x 60" Rubber Mill, m.d. 1—16 x 42" Rubber Mill, m.d. 1—Farrel-Birmingham 6" x 13" self-contained 3-roll Calender, m.d. 4—Bolling 18 x 18", 5-opening Hydraulic Presses. 1—Ferriot 24" Hydraulic Stock Cutter. 1—6' x 24' Vulcanizer, quick-opening door. 2—AMF 340-qt. Glen Mixers. Also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries.

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FOR SALE: FARREL 16" X 48" AND 15" X 36". 2 ROLL RUBBER mills, also new lab. 6" x 12" and 6" x 16" mixing mills and calenders, and other sizes up to 84". Extruders—1" to 3". Proctor & Schwartz 6-fan, 3-apron conveyor dryer. Baker-Perkins mixers 100, 50, 9, and 4½ gals., heavy-duty double-arm. Ball & Jewell & Leominster rotary cutters. Bethlehem 2,000-ton 10-opening hydraulic molding press. HPM 200-ton vert. 4-opening upstroke, 32" x 50" platens Large stock of hydraulic presses from 12" x 12" to 48" x 48", platens from 50 to 2,000 tons. Hydraulic Pumps and Accumulators. Crushers, Churns, Rubber Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 107 Eighth St., Brooklyn 15, N. Y. STerling 8-9066.

FOR SALE: SHERIDAN #17 EMBOSSING PRESS (54 X 26) with automatic feed and rewind attachment and automatic dwell attachment. Practically new. Address Box No. 1181, care of INDIA RUBBER WORLD.

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EXCELLENT BUYS AVAILABLE: BIRMINGHAM 3-ROLL CALender 22" x 64". Farrel-Birmingham 18" x 42" rubber mill, 75 h.p. motor. Banbury #3 mixer with 100 h.p. motor. Ball & Jewell #1½ SS rotary cutter with 40 h.p. motor. EQUIPMENT CLEARING HOUSE, INC., 289 Tenth Street, Brooklyn 15, N. Y.

Tire Cord Treating Unit FOR SALE!

Ross Waldron Latexing Machine for treating rayon and cotton tire cord available for immediate sale by a large rubber goods manufacturer in the United States.

Here's your opportunity to modernize your plant equipment and increase production. Maximum speed is 20 yards per minute; maximum width of fabric, 60 inches. Designed to operate on 440 volts, 3 phase, 60 cycle current.

The unit is complete, in excellent operating condition. It is being sold because a new, larger machine has been installed.

Don't miss this chance to add to your plant facilities. For further details and price, write INDIA RUBBER WORLD, Box No. 1166.

For SALE

1—Banbury #9 Mixer.
1—Banbury #1 Mixer with 50 HP Motor.
1—Baker Perkins Laboratory Size 6, Class BB, 2 Gal. Internal Rubber Mixer.
2—Thropp 2-Roll Rubber Mills, 18" x 50".
1—Thropp 2-Roll Rubber Mill, 14" x 30".
1—Thropp 3-Roll Rubber Calender, 18" x 54".
1—Royle #5 Rubber Strainer with 125 HP Motor & Drive
1—Ball & Jewell Stainless Steel #0 Rotary Cutter with Motor & Starter.
1—Paul O'Abbe #2 Master Rotary Cutter with Ball Bearings.
1—Adamson Vulcanizer, 2' x 12', with quick opening door, 150 lbs. W. P.
5—Cleveland Worm Gear Reducers, Size 800 AT, Series 24B, 1200 RPM, 8-1 Ratio, 75 H. P.

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Mills, — Hyd. Presses — Calenders — Banbury Mixers — Pumps — Extruders — Bale Cutters — Slitters — Vulcanizers — Grinders — Croppers — etc.

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Smith Co.; S. W. McCune, E. I. du Pont de Nemours & Co., Inc.; and Newell Perry, Thermoid Co. The retiring chairman and secretary-treasurer, J. S. Corrigal and P. Pinto, *Rubber Age*, respectively, became ex-officio members of the executive committee.

Sweitzer on Carbon Gel

A TALK on "The Role of Carbon Gel in the Reinforcement of Rubber" by C. W. Sweitzer, Columbian Carbon Co., highlighted the October 14 dinner-meeting of the Ontario Rubber Section, C.I.C., held at the University of Toronto, Toronto, Ont., Canada. Some 43 members and guests attended the dinner; while 60 were present at the technical session which followed.

Dr. Sweitzer stated that recognition of the carbon gel complex in 1949 as a fundamental factor in the carbon reinforcement of cold rubber has provided a new approach for following the development of the carbon-rubber bond and for evaluating the role of this complex in the reinforcement of all rubbers. This carbon gel complex, defined as the benzene-insoluble polymer associated with the carbon black in the unvulcanized state, sets the pattern for the properties developed in the final vulcanizate.

The mechanism involved in the development of the complex is primarily adsorptive, the speaker declared. In the initial stage the carbon black is completely wetted by the polymer with the coincidental development of primary carbon-rubber adsorption bonds. In the second stage these primary colloidal carbon gel units are knitted or cross-linked into an insoluble lattice coextensive with the unvulcanized stock. This lattice sets the pattern for the optimum tensile development in the vulcanizate. In the third stage this lattice can be stiffened through further cross-linking by means of additional heat. This stiffening sets the pattern for enhanced modulus development in the vulcanizate.

Dr. Sweitzer said that the factors dominating the optimum development of the carbon gel complex are total carbon surface, polymer molecular weight and unsaturation, and heat. The increased carbon gel level in the vulcanizate is associated with higher stiffness, as measured by modulus. This stiffening effect can also be measured by stress-strain tests on test rings prepared from the unvulcanized stock. Since no bridging agent is involved in these tests on the unvulcanized polymer-carbon masterbatch, it is concluded that carbon gel is the significant factor in the carbon reinforcement of all unsaturated polymers, the speaker concluded.

FINANCIAL

General Tire & Rubber Co., Akron, O. Nine months ended August 31, 1952: net income, $4,449,570, equal to $3.48 a common share.

Shell Oil Co., New York, N. Y. First nine months, 1952: net earnings, $62,656,651, equal to $4.65 a share, compared with $68,770,651, or $5.11 a share, a year earlier.

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. Nine months to September 30, 1952: net profit, $4,967,552, equal to $1.04 a common share, compared with $2,583,088, or 54¢ a share, in the corresponding months last year.

Boston Woven Hose & Rubber Co., Cambridge, Mass. Year ended August 31, 1952: net income, $636,159, equal to $6.89 each on 86,000 common shares, contrasted with $1,211,454, or $13.66 each on 85,485 shares, in the preceding fiscal year; net sales, $18,602,846, against $23,343,431; provision for income taxes, $655,000, against $2,152,000; current assets, $6,446,282, current liabilities, $1,935,236, against $9,171,211 and $3,546,826, respectively, on August 31, 1951.

Philip Carey Mfg. Co., Cincinnati, O. First nine months, 1952: net earnings, $1,586,251, equal to $1.91 a share, against $2,185,277, or $2.65 a share, in the 1951 months.

Diamond Alkali Co., Cleveland, O. First nine months, 1952: net profit, $4,186,747, equal to $1.68 each on 2,261,503 common shares, compared with $5,190,383, or $2.30 each on 2,243,228 shares, a year earlier; net sales, $57,169,091, against $60,443,689.

Koppers Co., Pittsburgh, Pa. January 1-September 30, 1952: net earnings, $6,887,033, equal to $3.45 a common share, compared with $7,541,922, or $4.39 a share, in the corresponding period of 1951.

Dow Chemical Co., Midland, Mich. Three months to August 31, 1952: net profit, $7,939,889, equal to 36¢ a common share, against $8,944,436, or 44¢ a share, in the like period last year; sales, $93,938,024, against $97,781,145.

The Eagle-Picher Co., Cincinnati 1, O., and domestic subsidiaries. Nine months ended August 31, 1952: consolidated net profit, $2,255,529, equal to $2.28 a share, compared with $2,880,716, or $2.91 a share, in the like period last year; net sales, $56,561,593, against $62,383,220.

Johns-Manville Corp., New York, N. Y. Third quarter, 1952: consolidated net income, $6,205,416, equal to $1.95 a common share, compared with $6,701,889, or $2.12 a share, in the corresponding quarter of 1951; sales, $62,888,586, against $58,040,337.

Monsanto Chemical Co., St. Louis, Mo. Nine months to September 30, 1952: net earnings, $16,080,360, equal to $2.97 each on 5,268,189 common shares, compared with $16,687,188, or $3.34 each on 4,868,189 shares, in the 1951 period; net sales, $189,290,342, against $207,012,340.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. First three quarters, 1952: net income, $56,292,149, equal to $3.89 each on 14,470,867 capital shares, compared with $49,751,662, or $3.74 each on 13,291,650 shares, in the same period the year before.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Wringer Co.	Com.	$0.25 q.	Oct. 1	Sept. 15
Anaconda Wire & Cable Co.	Com.	0.75	Oct. 21	Oct. 10
Baldwin Rubber Co.	Com.	0.10 extra	Oct. 24	Oct. 15
		0.15 q.	Oct. 24	Oct. 15
Boston Woven Hose & Rubber Co.	New Sp.	0.25	Nov. 25	Nov. 14
	New Init.	0.20	Nov. 25	Nov. 14
Dayton Rubber Co.	Class A.	0.50 q.	Oct. 24	Oct. 9
Detroit Gasket & Mfg. Co.	Com.	0.25 q.	Oct. 25	Oct. 10
DeVilbiss Co.	Com.	0.25 q.	Oct. 20	Oct. 10
E. I. du Pont de Nemours & Co., Inc.	$4.50 Pfd.	1.12½ q.	Oct. 25	Oct. 10
	$3.50 Pfd.	0.87½ q.	Oct. 25	Oct. 10
Firestone Tire & Rubber Co.	Com.	0.75	Oct. 20	Oct. 3
Garlock Packing Co.	Com.	0.25 q.	Sept. 30	Sept. 12
Goodyear Tire & Rubber Co.	Com.	0.75	Dec. 15	Nov. 17
	$5.00 Pfd.	1.25 q.	Dec. 15	Nov. 27
Lee Rubber & Tire Corp.	Com.	5%	Oct. 30	Oct. 15
		0.75 q.	Oct. 30	Oct. 15
Okonite Co.	Com.	0.50	Nov. 1	Oct. 17
Thermoid Co.	$2.50 Pfd.	0.62½ q.	Nov. 1	Oct. 15

United States Rubber Statistics—July, 1952

	New Supply			Distribution		Month-End
	Production	Imports	Total	Consumption	Exports	Stocks
Natural rubber, total	0	46,130	46,130	29,549	136	76,318
Latex, total	0	3,121	3,121	3,211	0	8,521
Rubber and latex, total	0	49,251	49,251	32,760	136	84,839
Synthetic rubbers, total	*53,311 †5,681	1,456	60,448	58,809	1,473	151,966
GR-S types‡	*46,143 †37	1,357	47,537	48,792	936	115,286
Butyl	*7,168	99	7,267	5,310	0	23,568
Neoprene‡	‡4,426	0	4,426	3,602	342	9,742
Nitrile types‡	†1,218	0	1,218	1,105	195	3,370
Natural rubber and latex, and synthetic rubbers, total	58,992	51,707	109,699	91,569	1,609	236,805
Reclaimed rubber, total	16,213	125	16,338	18,354	735	36,287
Grand Totals	75,205	51,832	126,037	109,923	2,344	273,092

*Government plant production.
†Private plant production.
‡Includes latices.
Source: Rubber Division, NPA, United States Department of Commerce, Washington, D. C.

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REBUILT BANBURY BODIES AND PARTS FOR SALE OR INterchange. Sizes #9 and #11 complete bodies available. Extra parts include rotors, door tops, and rings. We rebuild all sizes of Banburys and can also fabricate any parts needed. Our "Pre-Plan" rebuilding method saves your production time. Write for prices and details. INTERSTATE WELDING SERVICE, Offices, Metropolitan Bldg., Akron 8, Ohio.

FOR SALE: 1—SZEGVARI ATTRITOR TYPE B—60 GALS., 5 H.P. —s/s. 1—Ball & Jewell #1 rotary chrome plated cutter. 1—Abbe Eng. #0 rotary cutter. Address Box No. 1185, care of INDIA RUBBER WORLD.

FOR SALE: THREE ROLL CALENDER WITH 14" x 41" ROLLS, no drive. Address Box No. 1187, care of INDIA RUBBER WORLD.

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WANTED—TO EXPEDITE PRODUCTION—RUBBER MAKING machinery including Banbury Mixers, Heavy-Duty Mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set-up plant now operating or shut down. When offering, give full particulars. P. O. Box 1551, Church Street Sta., New York 8, N. Y.

WANTED: LARGE AUTOCLAVE. WE WILL BUY A USED AUtoclave approximately 6 ft. diameter and 16 to 30 ft. long. Please advise what you have and price immediately. MOLDED PRODUCTS, INC., Cockeysville, Md.

WANTED TO BUY: 1—60" USED RUBBER MILL, WITHOUT drive. Will buy at present location and pay cash. Address Box No. 1182, care of INDIA RUBBER WORLD.

WANTED FOR FOREIGN CUSTOMER ANY AND ALL TYPES of used molds for rubber products. If you have anything available, please address Box No. 1183, care of INDIA RUBBER WORLD.

RUBBER MILL 40" TO 60". NEW OR USED, MUST BE IN GOOD condition and complete with motor, drive, brake, etc. Give full information, including price and delivery. MAYFAIR MOLDED PRODUCTS CORP., 4440 N. Elston Ave., Chicago 30, Ill.

WE ARE INTERESTED IN PURCHASING ALL TYPES OF RUBber machinery consisting of mills, Banbury mixers, extruders, calenders, vulcanizers, etc., and also complete plants. Address Box No. 1184, care of INDIA RUBBER WORLD.

WANTED: THREE-ROLL CALENDER WITH 20" TO 24" ROLLS, with or without drive. Address Box No. 1186, care of INDIA RUBBER WORLD.

WANTED: TIRE SKIVING MACHINERY. C. BUNKER, BLOOMingdale, Ill.

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U. S. Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	June, 1952 Quantity	June, 1952 Value
UNMANUFACTURED, Lbs.		
Crude rubber	140,546,144	$48,168,471
Latex	9,912,720	3,934,931
Guayule	172,000	28,985
Balata	127,332	31,786
Jelutong or Pontianak	475,978	273,357
Gutta percha	112,073	50,941
Crude chicle	283,917	168,442
Synthetic rubber	5,136,787	1,314,670
Reclaimed rubber	224,005	11,877
Scrap rubber	2,150,425	64,648
TOTALS	159,141,381	$54,048,108
MANUFACTURED		
Rubber tires		
Auto, etc. ... *no.*	2,354	$124,334
Bicycle ... *no.*	2,272	2,502
Other ... *no.*	406	13,114
Inner tubes: auto, etc. ... *no.*	212	1,457
Footwear, boots ... *prs.*	17,326	45,846
Shoes and overshoes, *prs.*	37,962	15,252
Rubber-soled canvas shoes ... *prs.*	11,229	11,318
Athletic balls		
Golf ... *no.*	7,200	1,459
Tennis ... *no.*	23,076	5,479
Other ... *no.*	20,650	2,358
Toys	......	34,507
Hard rubber goods		
Combs ... *gr.*	7,200	782
Sundries	......	1,391
Other	......	1,345
Rubberized printing blankets ... *lbs.*	1,466	2,812
Rubber and cotton packing ... *lbs.*	1,670	5,010
Gaskets and valve packing	......	2,398
Molded insulators	......	3
Belting ... *lbs.*	1,660	5,893
Hose and tubing	......	6,138
Drug sundries	......	6,703
Nipples and pacifiers *gr.*	2,775	10,126
Instruments ... *doz.*	1,319	4,934
Other rubber products	......	914
Gutta percha manufactures ... *lbs.*	490	629
Rubber bands ... *lbs.*	1,335	911
Other soft rubber goods	......	91,942
TOTALS	......	$399,557
GRAND TOTALS, IMPORTS	......	$54,447,665

Exports of Domestic Merchandise

	June, 1952 Quantity	June, 1952 Value
UNMANUFACTURED, Lbs.		
Chicle and chewing gum bases	123,750	$54,011
Balata, gutta percha, etc.	600	1,719
Synthetic rubbers		
GR-S types	1,007,540	243,512
Neoprene	1,102,207	454,808
Nitrile types	438,023	237,295
Other, except butyl	37,456	25,945
Reclaimed rubber	2,022,684	190,913
Scrap rubber	1,585,875	65,912
TOTALS	6,318,135	$1,274,115
MANUFACTURED		
Rubber cement ... *gals.*	49,685	$99,831
And rubberized fabric *sq. yds.*	121,203	122,406
Clothing	......	120,731
Footwear		
Boots and shoes ... *prs.*	16,117	58,452
Rubber-soled canvas shoes ... *prs.*	29,013	51,320
Heels ... *doz. prs.*	19,023	21,381
Soles, soling and toplift sheets ... *lbs.*	607,532	175,232
Gloves and mittens *doz. prs.*	7,958	39,749
Drug sundries	......	152,897
Toys, balls, novelties	......	44,792
Hard rubber goods		
Battery boxes ... *no.*	15,323	30,022
Other electrical goods *lbs.*	145,989	89,464
Other	......	32,219
Rubber tires and casings		
Truck and bus ... *no.*	58,891	3,222,717
Auto and motorcycle *no.*	48,477	578,514
Aircraft ... *no.*	1,895	110,953
Off-the-road ... *no.*	15,273	1,945,502
Farm tractor ... *no.*	4,493	222,753
Implement ... *no.*	2,940	43,292
Other ... *no.*	10,923	65,130
Inner tubes		
Auto ... *no.*	44,148	82,156
Truck and bus ... *no.*	38,642	186,397
Aircraft ... *no.*	1,467	8,348
Other ... *no.*	13,900	53,304
Solid tires		
Truck and industrial *no.*	2,194	37,472
Other ... *lbs.*	4,582	574
Tire repair materials		
Camelback ... *lbs.*	571,688	186,367
Other ... *lbs.*	302,870	258,020
Rubber		
Tape, except medical and friction ... *lbs.*	61,332	53,842
Belting		
V-type fan belts. *lbs.*	97,057	127,149
Transmission		
V-belts ... *lbs.*	96,420	215,817
Flat belts ... *lbs.*	40,932	61,683
Conveyor and elevator ... *lbs.*	67,783	71,537
Other ... *lbs.*	1,788	3,461
Hose		
Molded and braided, *lbs.*	394,790	335,971
Wrapped and hand built ... *lbs.*	277,767	296,230
Other hose and tubing ... *lbs.*	98,637	132,204
Packing		
Sheet type ... *lbs.*	52,809	30,916
Other ... *lbs.*	142,947	182,353
Tiling and flooring. *lbs.*	145,785	38,628
Mats and matting. *lbs.*	653,747	177,161
Thread: bare ... *lbs.*	3,113	7,161
Textile covered ... *lbs.*	6,447	24,077
Compounded rubber for further manufacture *lbs.*	1,565,570	433,150
Other rubber manufactures	......	573,359
TOTALS	......	$10,794,694
GRAND TOTALS, ALL RUBBER EXPORTS	......	$12,068,809

Reexports of Foreign Merchandise

	June, 1952 Quantity	June, 1952 Value
UNMANUFACTURED, Lbs.		
Crude rubber	348,385	$190,975
GR-S type synthetic rubber	3,390	1,795
TOTALS	351,775	$192,770
MANUFACTURED		
Rubber drug sundries	......	$216
Toys, balls, novelties	......	850
Packing, except sheet type ... *lbs.*	10	105
Mats and matting. *lbs.*	1,262	992
Other	......	259
TOTALS	......	$2,422
GRAND TOTALS, ALL RUBBER REEXPORTS	......	$195,192

SOURCE: Bureau of the Census, United States Department of Commerce, Washington, D. C.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, Inventory, August, July, 1952; First Eight Months, 1952-1951

	August, 1952	% of Change from Preceding Month	July, 1952	First Eight Months, 1952	First Eight Months, 1951
Passenger Casings					
Shipments					
Original equipment	1,311,756		985,987	14,484,493	19,099,592
Replacement	5,335,845		5,057,833	32,836,177	23,562,100
Export	84,526		72,076	467,095	429,852
TOTAL	6,732,127	+10.08	6,115,896	47,787,765	43,091,544
Production	5,927,182	− 0.85	5,977,971	48,468,255	43,024,897
Inventory end of month	7,785,069	− 8.89	8,544,855	7,785,069	2,967,432
Truck and Bus Casings					
Shipments					
Original equipment	320,236		200,382	3,391,927	3,790,081
Replacement	890,262		787,086	5,639,347	6,764,472
Export	46,529		44,611	575,607	508,258
TOTAL	1,257,027	+21.80	1,032,079	9,606,881	11,062,811
Production	1,005,640	−10.13	1,118,940	10,671,080	11,379,662
Inventory end of month	2,851,786	− 8.07	3,102,192	2,851,786	1,065,074
Total Automotive Casings					
Shipments					
Original equipment	1,631,992		1,186,369	17,876,420	22,889,673
Replacement	6,226,107		5,844,919	38,475,524	30,326,572
Export	131,055		116,687	1,042,702	938,110
TOTAL	7,989,154	+11.77	7,147,975	57,394,646	54,154,355
Production	6,932,822	− 2.31	7,096,911	59,139,335	54,404,559
Inventory end of month	10,636,855	− 8.67	11,647,047	10,636,855	4,032,506
Passenger Including Motorcycle and Truck and Bus Tubes					
Shipments					
Original equipment	1,638,420		1,185,084	17,876,371	22,889,662
Replacement	3,706,000		3,227,837	23,463,835	23,047,296
Export	86,496		94,034	748,596	565,520
TOTAL	5,430,916	+20.50	4,506,955	42,088,802	46,502,478
Production	4,867,085	+ 1.61	4,789,948	42,661,664	44,640,811
Inventory end of month	10,627,482	− 5.31	11,223,276	10,627,482	6,272,190

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

Compounding Ingredients—Price Changes and Additions

Accelerator-Activators, Inorganic

Litharge, Eagle and National Lead ... *lb.*	$0.1675	/	$0.1685
Red lead, Eagle and National Lead ... *lb.*	.1775		
White lead, basic: Eagle and Natl. Lead ... *lb.*	.1625	/	.1725
White lead, silicate: Eagle *lb.*	.175	/	.1925
National Lead ... *lb.*	.15	/	.16

Blowing Agents

Blowing Agent CP 975 ... *lb.*	.35		

Carbon Blacks

(MAF) Philblack A ... *lb.*	.06	/	.10
(SAF) Philblack E ... *lb.*	.135	/	.175

Colors—White

Zinc oxides:			
Azo ZZZ-11, -44, -55 ... *lb.*	.1425	/	.1525
35% leaded ... *lb.*	.144	/	.154
50% leaded ... *lb.*	.145	/	.155
Eagle AAA, lead-free ... *lb.*	.1425	/	.1525
5% leaded ... *lb.*	.1425	/	.1525
35% leaded ... *lb.*	.144	/	.154
50% leaded ... *lb.*	.145	/	.155
Florence Green Seal ... *lb.*	.16	/	.17
Red Seal ... *lb.*	.155	/	.165
White Seal ... *lb.*	.165	/	.175
Horsehead XX-4, -78 ... *lb.*	.1425	/	.1525
Kadox-15, -17, -22 ... *lb.*	.1425	/	.1525
-25 ... *lb.*	.165	/	.175
Lehigh 35% leaded ... *lb.*	.144	/	.154
50% leaded ... *lb.*	.145	/	.155
Protox-166, -167 ... *lb.*	.1425	/	.1525
St. Joe, lead-free ... *lb.*	.1425	/	.1525

Plasticizers and Softeners

Harchemex ... *lb.*	.3025	/	.39
Harflex 500 ... *lb.*	.36	/	.3875

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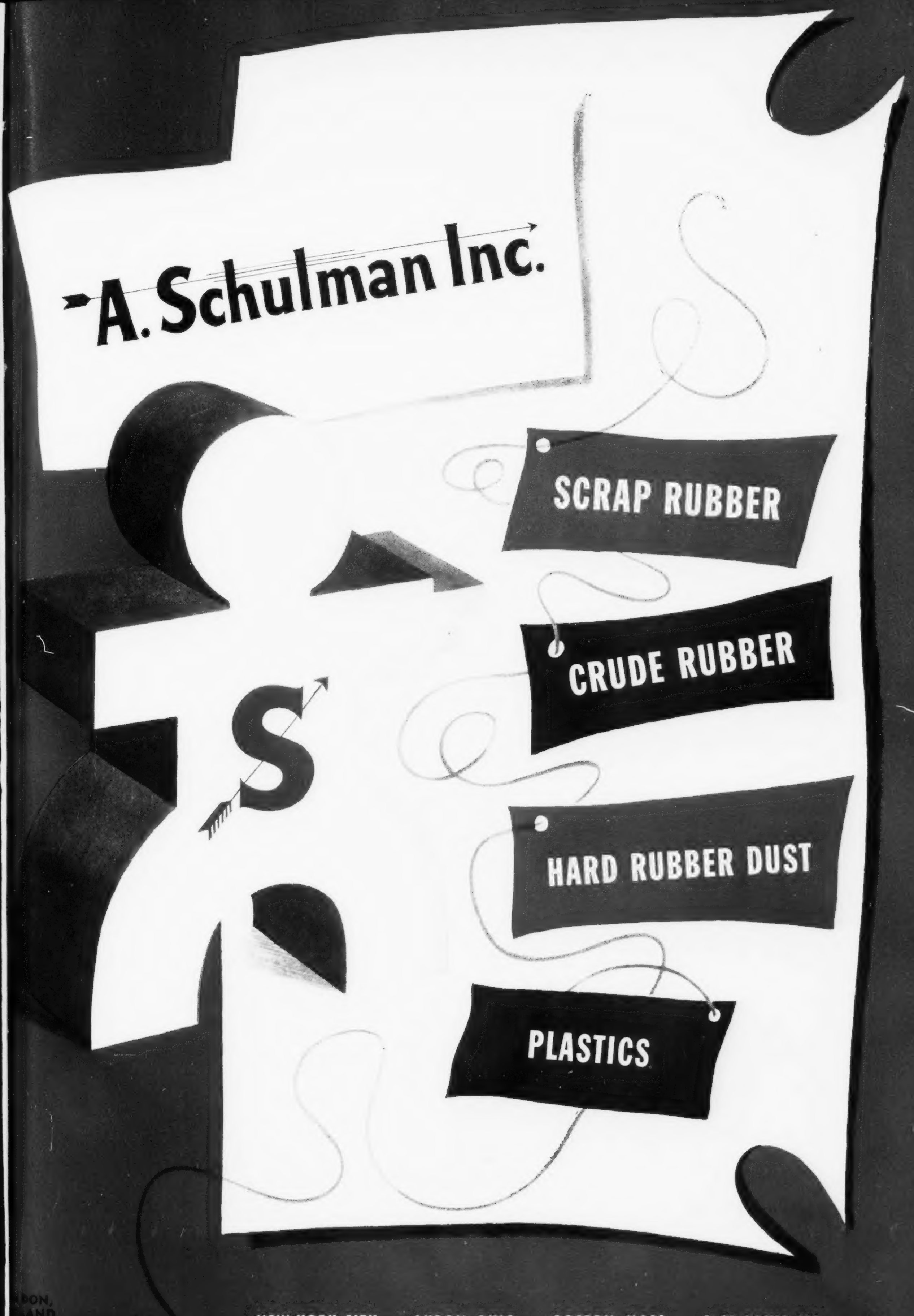
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